FLYING AND POPULAR AVIATION

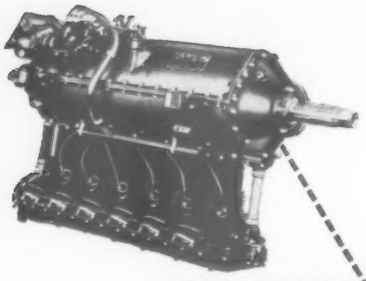
WE MUST LEARN FROM THE GERMANS!

By REP. FRANK C. OSMERS, Jr.
Congressman from New Jersey

DOUGLAS "BOSTONS"

...e RUSSIAN
...IR FORCE

JAMES L. H. PECK



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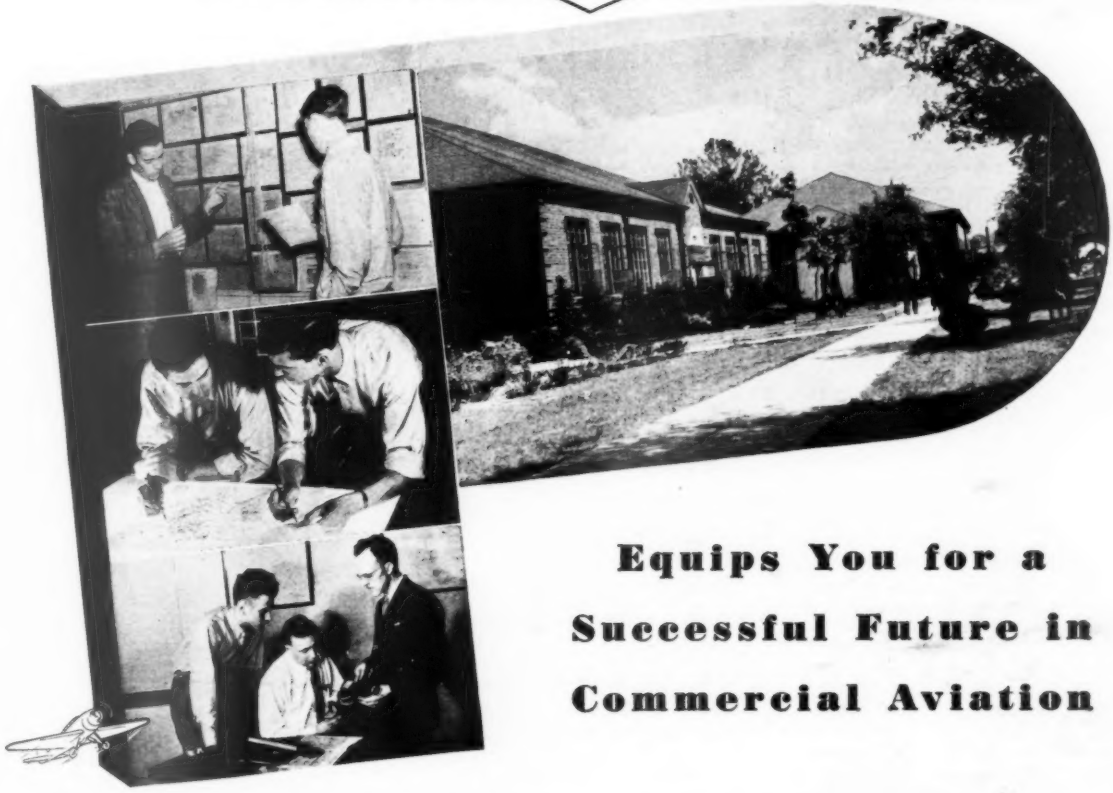

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Section PA-10

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GERMAN industry and communication are at last getting the long-awaited pounding from the Royal Air Force. The RAF did what we expected; they built up their reserves of bombardment aircraft (many from the U.S.) and pilots. The opening they were waiting for came when Hitler attacked Russia and was forced to move large numbers of the *Luftwaffe* to that front. From that point on, our column in the January, 1941, issue tells the rest of the story:

" . . . Few people seem to realize the scope of the offensive the British are almost sure to launch next spring or summer. The major portion of that offensive will be by air [it has been] . . . Several thousand flyers soon will come to the United States for initial training at many of those private flying schools throughout the country that have been training U.S. Army pilots [the first group of these young men graduated recently] . . . The RAF will have sufficient numbers of . . . Curtiss P-40's [*Tomahawks*], Martin 167's [*Marylands*] Douglas *Bostons* [and the modified *Havoc* night fighter], as well as the veteran Lockheed *Hudsons*, on hand this spring—and production of these types is running ahead of schedule—to wipe the German air force out of the skies over England [this already has happened in many portions of the British Isles] . . . Boeing *Flying Fortresses* . . . will carry the actual offensive over Germany. The B-17's will go over, accompanied by long-range, heavily-armed fighters, at altitudes up to 35,000 feet [the RAF recently reported the first raids with Boeings—and they went over at exactly 35,000 feet] . . . At 35,000 feet British bombers will be well out of range of anti-aircraft . . . German interceptors — even if they are warned of the bombers' approach—could not reach such high altitudes before the bombers' work was done and they were on their way home. So German and Italian industry will be subjected to devastating bombing raids in broad daylight as well as at night . . ."

Wish we had taken a few bets from some people who laughed when we wrote that column back in December, 1940.

* * *

NOW that you've seen our Army issue you have some idea why we've been so punch-drunk for the last two months. After all, it was the first time in the history of the magazine that we turned out one issue involving several hundred thousand words, over 300 illustrations, 284 pages and innumerable quantities of aspirin and black coffee. We tackled just about every kind of publishing problem possible. We constantly were searching

(*Continued on page* 106)

FLYING
AND POPULAR AVIATION

Volume XXIX Number 4

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DON'T GO *Half Way* INTO AVIATION!

Aviation has JOBS for thousands, but CAREERS only for trained men!

WHILE the great temporary emergency forces aviation to give jobs to many quickly and inadequately trained "single phase" men, these jobs will last only as long as the emergency that caused them. There has never been a finer opportunity for you to embark upon a secure, interesting and profitable career in aviation. BUT only if you train thoroughly for the responsibilities of that career and choose the right school for your training. The leaders of aviation who have made it THEIR career know from long experience what training is required to fill responsible supervisory positions and they know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fulfill the industry's most exacting requirements. You are only fooling yourself if you try to fool them with halfway training.

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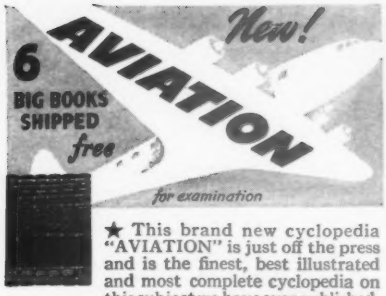

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NOVEMBER ISSUE

FLYING
AND POPULAR AVIATION

AT ALL NEWSSTANDS OCT. 10th

Letters

Yanks in Canada

Sirs:

I have just finished reading with interest "Yanks in Canada" in the June, 1941, issue of FLYING AND POPULAR AVIATION . . . However, I have yet to see anything about the many American pilots up here under contract for the "duration," flying multi-motored *Ansons* in the many Air Observation Schools throughout the Dominion.

When I arrived in Regina, Saskatchewan, on March 1, the temperature was 33° below freezing. Regina is where Air Observation School No. 3 is located. One of the best organized in Canada, it is doing an excellent job of training navigators. It also is equipped to train co-pilots. When I came up the requirements were supposed to be a commercial license and 500 hours. Since then, however, I've learned of several with just a private license and 100 or 200 hours. At least one had only a solo permit in the States.

The co-pilot training consists of a long course in navigation, Link and actual instrument time and night flying. As soon as you arrive you start flying trips as a co-pilot until you have built up at least 100 hours this way. Then you are taken off trips and given instruction in the *Ansons* on instruments and night flying. Finally you are taken up with an RCAF rating officer and if you fly all the tests to his satisfaction you are rated out as captain of bi-motored Anson aircraft.

I was fully rated out as described above about two weeks ago and assigned to A.O.S. No. 7 here in Portage la Prairie, Manitoba. These schools train navigators for overseas duty. The kids are all in the RCAF and our job is to fly them night and day on trips similar to those they will make overseas. The RCAF owns the *Ansons* and all personnel except pilots and managing executives are in the RCAF.

Until I arrived in Canada I had very little experience in multi-motored equipment, but I now have at least 300 hours in the *Ansons*—bombers equipped with two 350 h.p. Armstrong Cheetah motors. These ships still are used in England to some extent and most of ours saw service. They make excellent ships for training navigators, observers and radio operators.

The pay is fair, considering all angles, and the people are only too willing to meet you more than half-way. Unfortunately there have been one or two fellows from the States that just did not belong up here. They made things unpleasant for themselves and all others concerned before they went back home.

I started flying at New Orleans' old Menefee Field in 1929, obtaining my transport license (No. 11163) in 1930. Since then I've barnstormed all over the south and done a lot of instructing. I also have flown for various individuals and companies. My home is at Avery Island, La. I'm 39 . . . My total time to date is 1,500 hours, including the *Anson* time. The next time my license goes home for renewal I will get a 4M rating from my flying here. . . .

Some of the Americans I have run into up here include Ken Quayle, "Red" Williams, Ross Peacock, Johnny Ross, W. K. Vansickle, Ray Nickelson, Jack Marchand, "Crop Duster" Sheilds, Sid Alston, Larry Berriman, Hal Dixon and Joe Murphy. . . .

DUDLEY "DUD" AVERY.
Portage la Prairie, Manitoba

Dudley Avery in an "Anson."

Army Issue

Sirs:

The U.S. Army Air Forces issue of FLYING AND POPULAR AVIATION surely presents a complete analysis of the . . . Air Forces . . . The publication is an excellent work and a worthy contribution to the science of aeronautics . . .

Maj. Gen. GEORGE H. BRETT,
Chief of the Air Corps.
Washington, D. C.

Sirs:

. . . I feel that this issue . . . is a text book of the variety which should do the general public and us a great deal of good. I believe that all your effort to get this on the newsstands is going to be worth every ounce of strength and sweat you have given to this end . . .

Col. ST. CLAIR STREETT,
Office,
Assistant Secretary of War for Air.
Washington, D. C.

Sirs:

CONGRATULATIONS ON YOUR AIR FORCES ISSUE. AN EXCELLENT JOB. AM USING IT AS A TEXT.

Capt. NOEL PARRISH,
U. S. Army Air Corps.
Tuskegee, Ala.

(*Continued on page* 103)

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The Birdmen's Perch

My, my, it's wonderful the way flying moves so many fellows to poetic outbursts! Below you'll find a contribution from one of the most prolific of them all.

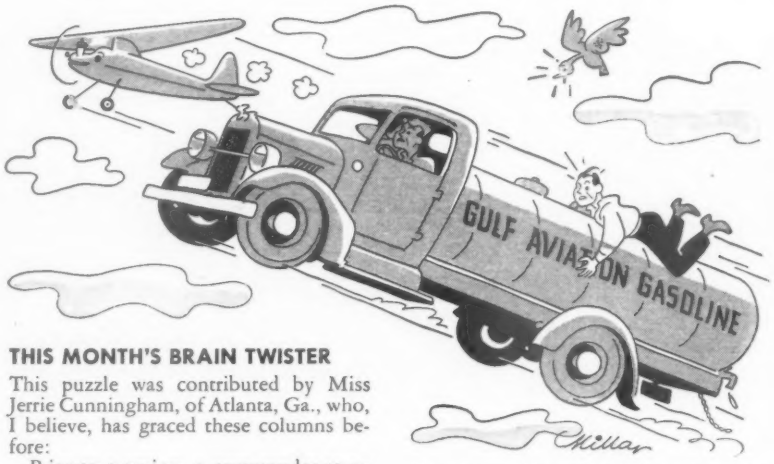
Major Al Williams, alias "Tattered Wing Tips," Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh, Pa.

WOOING THE MUSE DEPT.

The saga of "Haywire Brown" is from the pen of Russ Brinkley, Aviation Director of station WHP, Harrisburg, Pa.

Worst of all the careless pilots, to my knowledge
Was the barnstormer we knew as Haywire Brown.
The ship he flew was ready for the junk yard
But he managed to get by, from town to town.
His second-hand jallopy, I remember,
Was all patched up with two-by-fours and nails
And here and there a good old strand of haywire
Kept ailerons from turning into sails.
Sometimes these improvisions caused Brown trouble
As he flew along, but then, he'd only frown
And say to himself, as though he too believed it,
"I'll have to fix that thing—when I get down."

Bolt after bolt; nut after nut departed.
The wires stretched and the fabric ripped to shreds.
But still the poor old airplane kept on flying
As the cylinders on the engine lost their heads.
This could only last so long, as you have reasoned
So, one day, when it was expected least,
The controls decided not to function
At the very moment that the engine ceased.
All this was most disconcerting to our pilot.
The last remaining thing to do was jump.
He recalled his 'chute had not been packed in two years
And in his throat there quickly rose a lump.
He jumped, and as he fell through space unheeded,
Alas, alack, poor careless Haywire Brown,
His final words as his parachute failed to open—
"I'll have to fix that thing—when I get down!"



THIS MONTH'S BRAIN TWISTER

This puzzle was contributed by Miss Jerrie Cunningham, of Atlanta, Ga., who, I believe, has graced these columns before:

Prior to a review, a commander at an airport ordered his men to take ten planes and arrange them in 5 rows, with four planes in a row, and each row absolutely straight. How did they do it?

THE BEST IS NONE TOO GOOD

Suppose, you acquired a beautiful plane—minus the motor. Now it might be that you'd pick up, an old, broken-down motor and put it in that plane. But it's more likely you'd wait till you could afford an engine worthy of the plane.

Yes, most flyers are pretty realistic—when it comes to planes and motors. That's why they know it makes sense to give their valuable motors the very best lubricants possible.

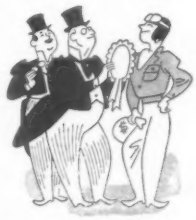
Just look around and you'll notice that more and more airmen are insisting on Gulfpride for their motors. They know it's refined by the special Alchlor Process from the finest crudes obtainable—that, actually, *more* of the trouble-making carbon- and sludge-formers are removed because of the extra care taken with Gulfpride. Isn't *that* the kind of oil you want for your engine?

WANTED...One "good enough" airplane motor, cheap! No questions asked!

THIS MONTH'S WHOPPER

Dear Major,

Please find enclosed $999.96. This is one half of my profits on crop dusting, which I feel you should have, as it was made possible by your wonderful Gulf Aviation Gas. It happened this way: We had just had a terrible plague of bugs and all the crop dusting pilots were on vacation. But they'd left a truck load of G.A.G. sitting on the flying field. I had just finished a gas model, and decided to fly it. I took it out to the flying field and took nine drops of G.A.G. from the truck to test it with. As soon as the gas hit the bottom of the tank the plane gave a shiver of delight, and reaching out with its own landing gear, spun its prop. With an ear-splitting roar it caught, and jumping off the field, circled twice, and then came down and opened the valves of the G.A.G. truck. Then grabbing the radiator ornament with its tail skid, roared across the field, and took off *with* the truck.



Not only did that G.A.G. as it sprayed down from the truck exterminate the bugs, but it stimulated the plants into one of the biggest crops we have ever had.

Yours truly,
Ralph Nichols, Jr.
Topeka, Kansas.

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Actually the difference between a temporary job and a career may be only an extra few months of carefully selected training!

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Aviation—most important of all National Defense projects—needs and *demands* more California Flyers trained men, is requesting more than 20 times the number now enrolled. Serve your nation in its most vital industry—Aviation. (If you are of draft age—write California Flyers School of Aeronautics outlining your individual situation.)

Do not accept *unapproved* or job training when it costs no more to attend one of the nation's oldest and most highly respected aeronautical schools—a school with the highest Government Approval in every division in which approval is extended—a school selected by the U. S. Army Air Corps to train its aviation mechanics, and by the CAA to train pilots and instructors—a school with shops and laboratories among the finest equipped in the nation—operating one of the country's largest, modern civilian training fleets—and located directly on the famous Los Angeles Airport, test field in the Nation's Aviation Capital, the very center of America's great aviation industry. Yes, California Flyers School of Aeronautics is one of the nation's great aviation schools—*Check with any authority.* Get the complete story of Aviation as a career now,—mail this coupon today. →

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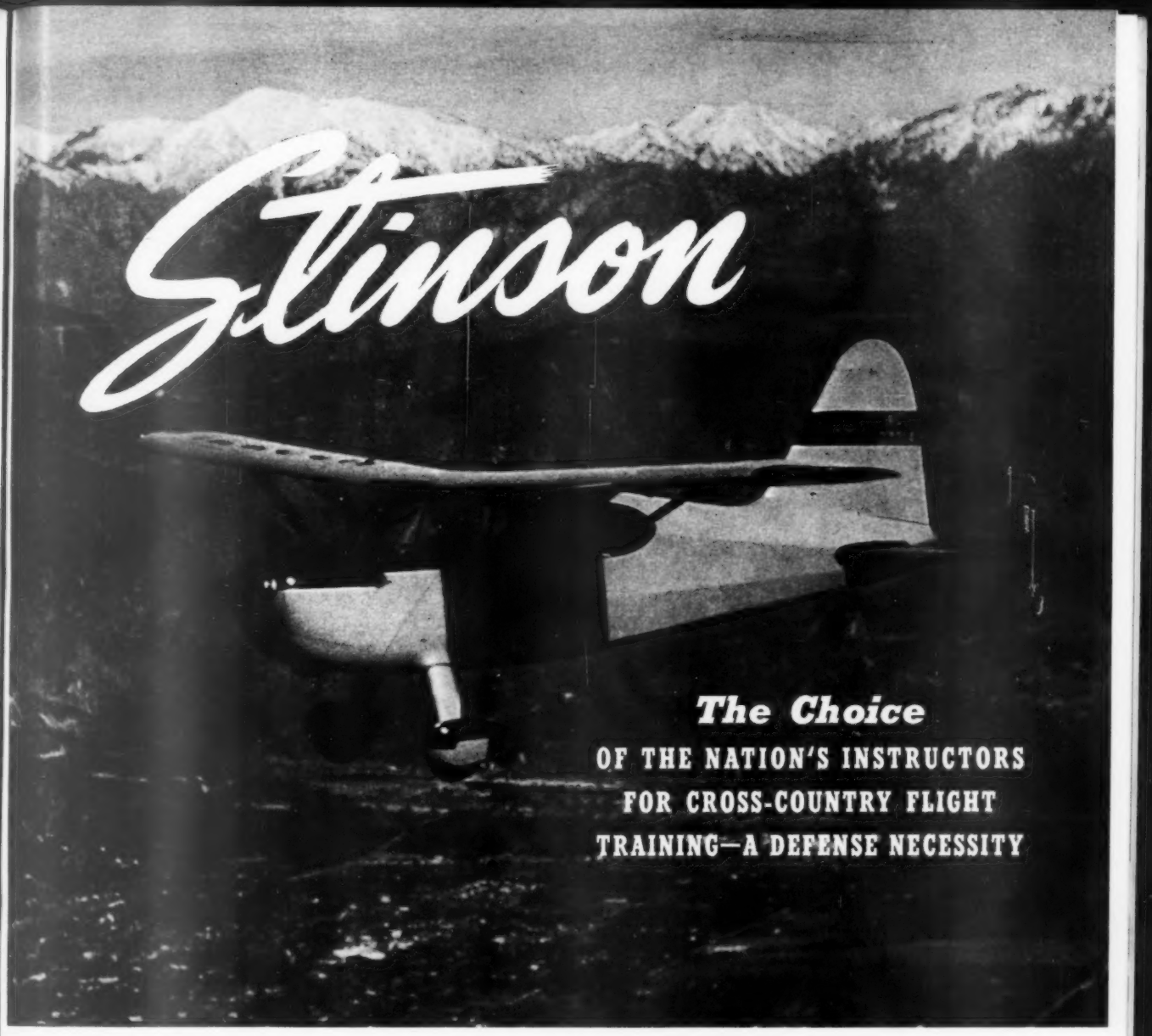

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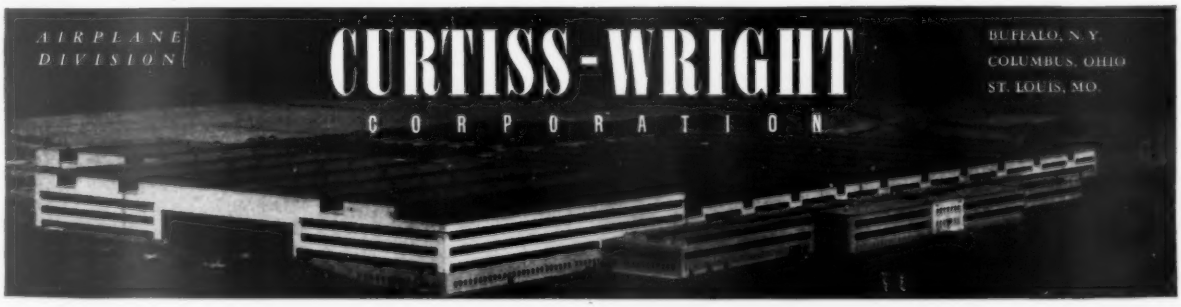
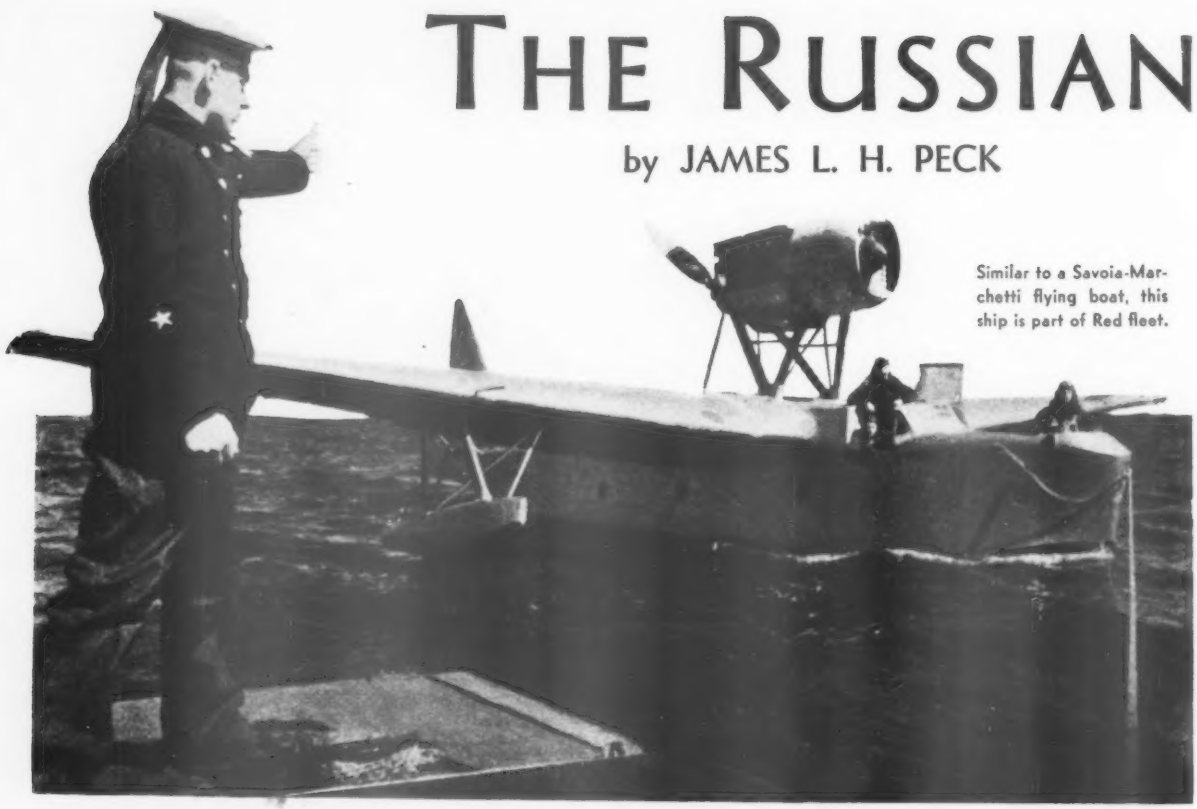


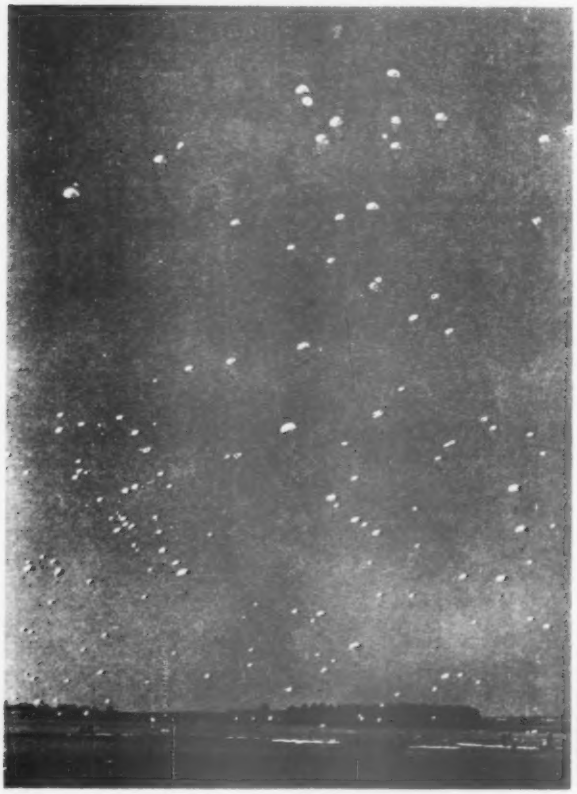
THE RUSSIAN

by JAMES L. H. PECK

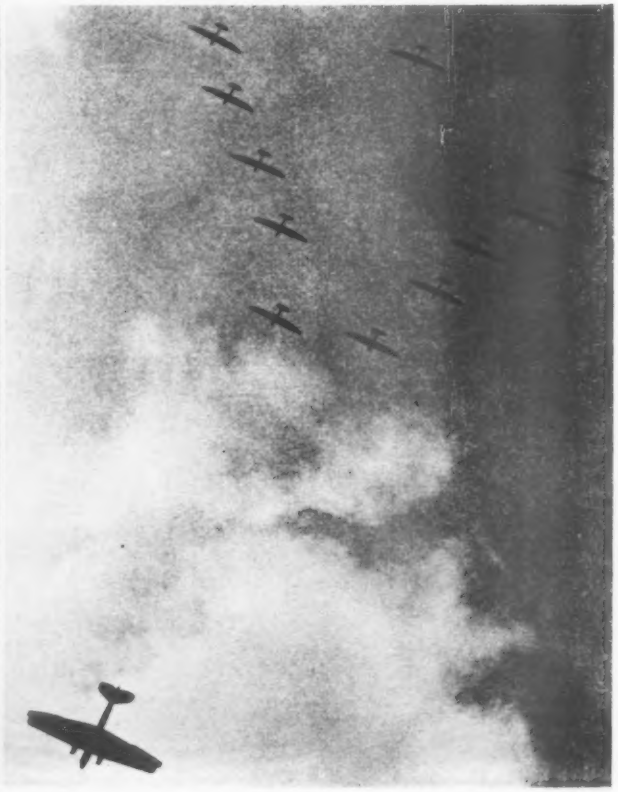


Similar to a Savoia-Marchetti flying boat, this ship is part of Red fleet.

Russians developed parachuting from sport into military weapon. Two thousand Red 'chutists helped invade Rumania.



Glider trains and tank-carrying planes were first introduced by Russian army. Large plane (below) can pull 11 troop-filled gliders.



AIR FORCE

Russian airmen are fighting capably against the Germans. Planes in picture are I-15's.

Soviet air power is trading blow for blow with the German Luftwaffe, with surprising results. Here are details of planes fighting the Battle of Russia.

THIS article reaches the newsstands just at the close of the 12th week of the Battle of Russia. Although much still is obscured by the hidden goings-on military men refer to as the "fog of war," the two most important facts are already perceptible. The *Luftwaffe* has met its match. The mighty *Wehrmacht* has been stopped and is even admittedly hard-pressed in local counter-offensives. The Reds have shattered the legend of Nazi invincibility.

The very character of this resistance on the part of the defenders makes clear that the *Luftwaffe*, despite the tactical advantage of early surprise and despite an all-out effort, had not gained the air superiority prerequisite of successful *panzer* operations. Whether or not the Red air forces are able to maintain the aerial balance depends upon a number of tangibles and intangibles which have come to be known as the Red enigma. But it's no longer such an enigma.

It is an air power of the first order, comprising an estimated 31,000 military aircraft, of which only some 12,000 are believed to be second-line reserve craft.

James L. H. Peck flew for the Loyalists in Spain, knows Russian aircraft well. He has written several widely-read books on aviation.—Ed.

These figures are estimates based on highly reliable information and checked against evaluations derived from other sources which we will discuss presently. Further, the figures are as of January of this year and do not include naval aircraft attached to Red navy fleets in the Black Sea, Baltic, Arctic and Far East, or civil planes.

The Red air force is a semi-autonomous body. It is, in effect, more of an independent air arm than this would seem to indicate. Six years ago, in the January, 1935, issue of *Voina i Revolutsia*, Colonel Chripin, then deputy-commander of the Red air force, wrote:

"It is impossible to wage modern warfare without conducting independent air operations. The success of all land and sea operations depends upon successful activity of the air arm."

The air force is divided into 16 military districts, each having its commander and, immediately subordinate to him, a district chief of air forces. The Independent Bombing Force—which might be described as an air force within an air force, similar in organization and function to our Combat Command—consists of a huge and highly mobile striking force of heavy, medium, dive and light bombers complemented by a fighter force and reconnaissance. The district subdivisions correspond, roughly, to the Soviet republics or states.

The first check of the 31,000-plus figure was made against a comment appearing in the July, 1940, issue of *Voyenna Mysl*, the organ of the Red army. Discussing the Soviet principle of close cooperation between ground and air forces, this piece states that two armies (nine army corps) require not less than 3,500 aircraft for the support of offensive operations. An army corps (three divisions) consists of, roughly, 60,000 men and the Red army is estimated, by one of our highest Army officials, to comprise 220 divisions, exclusive of reserves. If the Soviets came up to only one-fourth of this quota during the fiscal year the figure mentioned could be considerably exceeded.

Red production is high, possibly as high as Germany's. Surprising though this may seem, it used to be higher. In the December, 1936 issue of *Militaerwissenschaftliche Rundschau*, organ of the German War Ministry, their attaché in Italy —Colonel von Bülow—estimated Soviet plane production at 8,000 for that year.

He considered the Red air force the largest and strongest in Europe. To go back a year, this production figure checks closely with official Russian reports. During 1935, production of military craft reached the 4,000 mark and 1936 output is known to have been stepped up 93 per cent. A 1937 issue of another Nazi military organ, *Wehrmacht*, mentioned Soviet aviation numbering between 15,000 and 17,000 planes. In mid-summer of 1938 some 25,000 workers were employed in the largest factory, Plant No. 22 near Fili, working three shifts around the clock. Arthur Nutt, vice president of the Wright Aeronautical Corp., two years ago visited one of the new Russ plants where Wright *Cyclones* are built under license. He later told an SAE (Society of Automotive Engineers) meeting that this plant was geared to turn out 10,000 motors annually.

This military production is administered by a branch of the Commissariat of Defense—the War Aircraft Trust, headed by Aleksei I. Shakurin. A system has been employed for several years which parallels our "farming-out" of orders for sub-assemblies. Certain plants turn out specific materials and parts. Another branch of the Commissariat is the Scientific Motor Institute, which is concerned with both civil and military engine production. Outstanding among these motors are the 1,300 h.p. Toupolev, 1,250 h.p. Mikouline, 1,200 h.p. M-27 *(Cyclone)*, 1,000 h.p. M-85 (Gnome-Rhone), 950 h.p. M-34 and 860 h.p. M-100 (Hispano-Suiza). As is self-evident, these compare favorably with current service engines in any country, insofar as horsepower is concerned.

The discussion has, thus far, taken into account quantity rather than quality. How good are these thousands of Russ planes and engines? Modern Soviet aviation underwent its first test under fire in the Spanish Civil War. As now is well known, the Red flyers proved their superiority over both German and Italian airmen, and their fighters and bombers compared most favorably with those in first-line service in any country during 1936-37. Shortly after the *Chato* (I-15 biplane) and *Mosca* (I-16 monoplane) fighters appeared in Spanish skies, the Republicans gained air superiority and held it until the sheer weight of numbers of Nazi and Italian craft shifted the aerial balance in favor of Franco's fascists. Insofar as bombers are concerned, the Russian *Katuska* (ZKB-26) turned out to be the finest medium bomber used by either side. I make these statements advisedly. I flew the I-15 and I-16 fighters during my service with the Republican air force. The highest tribute I can pay to the Russian pilots I saw in Spain is that, after having met both Germans and Italians in combat, I would rather take on either than do battle with a Red pilot. The planes were not so beautifully finished as American fighters and bombers, but were as well appointed as German craft we saw on the ground and much neater than any of the Italian ships. Russian planes are sturdy and well-built.

There has been much written and said about the "failure" of Russian aviation during the Battle of Finland. There can be little doubt that the Reds made costly mistakes on the ground and in the air during the earlier phases of the war in the North. There can be even less doubt that air war scores such as those of February 19, 1939 (according to the New York *Times*) (90 Finnish planes, February 24, (83 Finnish craft), and March 2. (88 Finn aircraft) are the handiwork of inferior fighter pilots and planes. The tactical handling of some 800 bombers over Helsinki that fateful day in an air blitz unsurpassed until the aerial Battle of Britain last year, does not smack of inefficiency—terrific losses or no. The problems attendant upon the maintenance of an air force in weather averaging 30 degrees below zero throughout the 104-day war were surmounted in such a way as to leave little doubt of the caliber of Red air force ground organization.

How do the Reds stack up against the *Luftwaffe* in the present conflict? According to our sources, the Reds have three new fighters in service that compare most favorably with the best of the Nazi combat planes:

I-21. Twin-engined, two-seater monoplane. Engines, two 1,300 h.p. Toupolevs. Speed, 400-plus m.p.h. Armament, two 20 mm. cannon, six machine guns.

I-20. Single-engined, single-seater monoplane. Engine, 1,300 h.p. Toupolev. Speed, 378 m.p.h. Armament, one 20 mm. cannon, six machine guns.

I-18. Single-engined, single-seater monoplane. Engine, 1,250 h.p. Mikouline. Speed, 340 m.p.h. Armament, one 20 mm. cannon, six machine guns.

Only the Nazi Focke-Wulf, Heinkel He-113 and Messerschmitt Me-110 and Me-109F fighters can cope with these craft—and there are no reports of the Focke-Wulf ships being in service as yet. Two obsolescent Soviet types which performed exceedingly well in both Spain and China serve as second-line reserve fighters:

I-17. Single-engined, single-seater monoplane. Engine, 860 h.p. M-100. Speed, 300-plus m.p.h. Armament, one 20 mm. cannon, four machine guns.

I-16. Single-engined, single-seater monoplane. Engine, 750 h.p. M-25 *(Cyclone)*. Speed, 280-plus m.p.h. Armament, four machine guns.

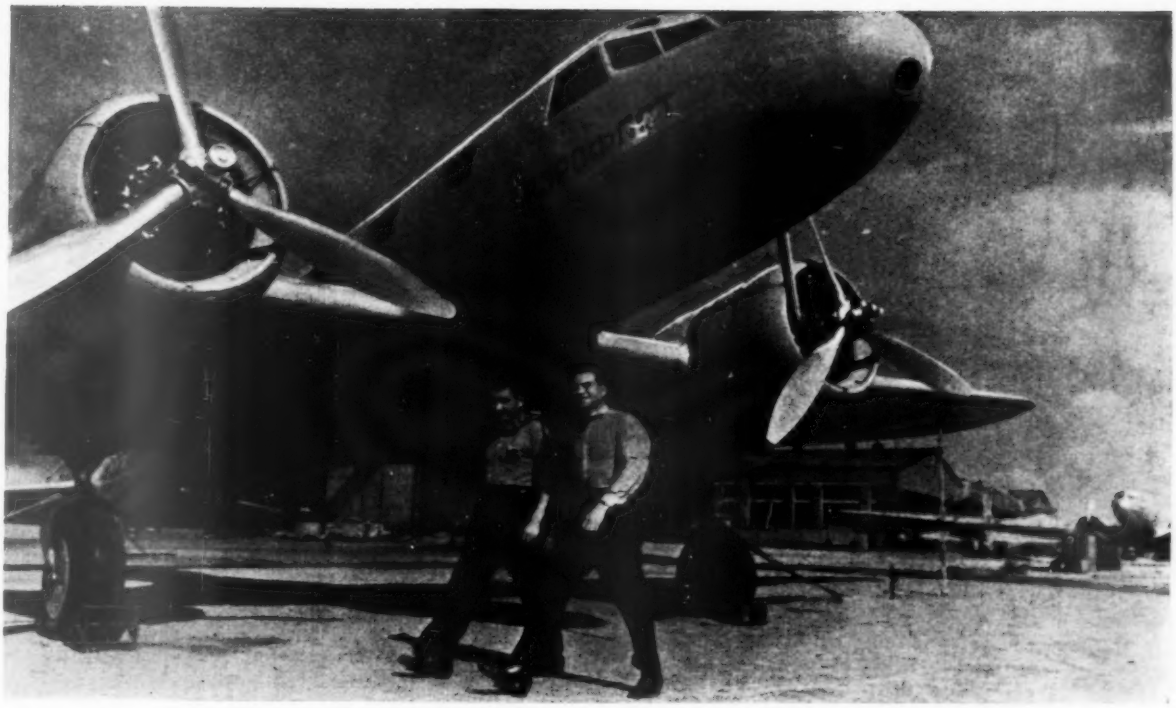
As dive bombers, the Reds are using a number of American-built Vultee V-11GB attack planes, a new type revealed by my sources as, simply, "a Russian modification of the Vultee plane," and the I-15 biplane. The latter is the most widely used, according to reports, perhaps because there are more of them than the other types. This ship, which did yeoman duty in Spain as the *Chato*, has been re-stressed for greater warloads, fitted with retractable landing gear and a more powerful motor—probably the M-26, 950 h.p. *Cyclone*. The type I flew in Spain with an M-25 engine and fixed landing gear with wheel pants was good for 245 m.p.h. The beefed-up model, even with heavy bomb load, should be much faster.

The Soviets are reported to be using three types of medium bombers. Available data on the older two appears below. The only information concerning the newer ship is that it is a somewhat smaller adaptation of the Douglas DC-3 airliner powered by 1,200 h.p. M-27 engines. (Another report had this ship powered by liquid-cooled engines). Considering the fact that the favorite Red airliner, the ANT-35 (initials of the plane and engine designer, A. N. Toupelov—"purged"), is a good copy of the Douglas and is good for 248 mp.h., the new bomber

(*Continued on page* 62)

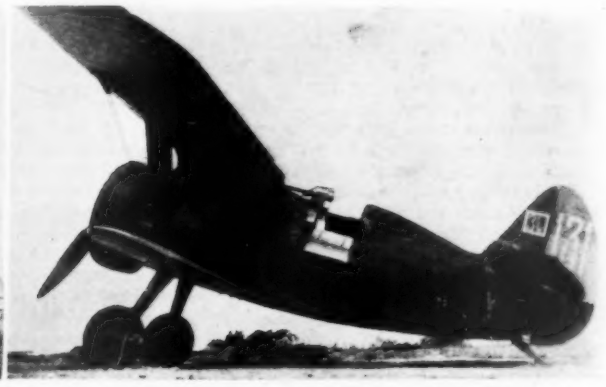
These Soviet ZKB-26's have retractable skis. First ship uses old radiator cowl, while others have streamlined cowlings like German planes.

Close-up of ZKB-26 shows out-moded engine cowling and radiator. Nose guns probably are .30 caliber.



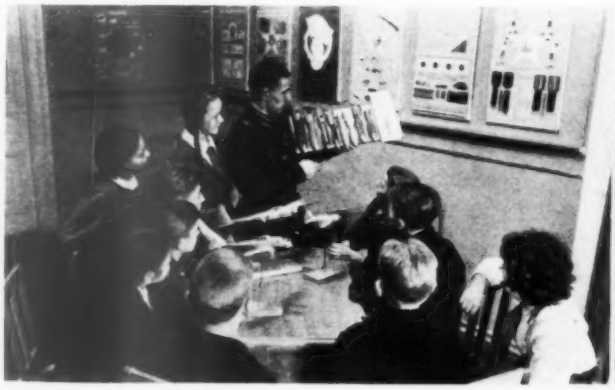
This Soviet ANT-35 airliner is similar to Douglas DC-2's. Props are American, made under license.

Loading bombs on I-15 dive bomber. This model with retractable gear is successor to plane at right, used effectively in Spain.

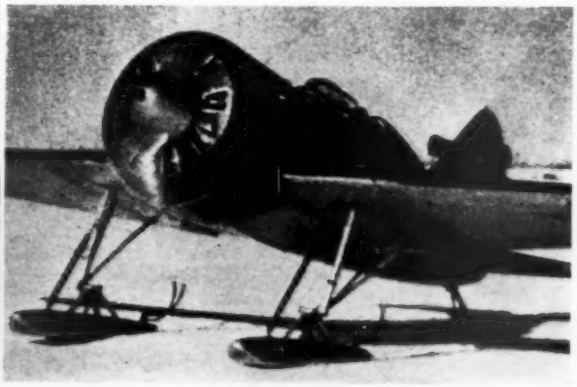


Original I-15 (above) resembles old U. S. Boeing P-12's. It is best-liked Red dive bomber. Author flew this type in Spain.

Soviet youths study war with models. Largest is new secret bomber copied from Boeing B-15. Others are medium bomber and new fighter.



Powered with a Wright "Cyclone" engine made in USSR, this I-16 fighter (below), equipped with skis, mounts four machine guns.



A year ago this was the entire Edo factory. Today it merely is one of three comparable buildings.

Float Factory

by EDWARD H. LAWSON

Just about every pontoon-equipped airplane on earth got its underpinnings from this unusual little plant on Long Island.

NONE of America's many fast-expanding aircraft factories is growing more swiftly than the little Edo plant at College Point, L. I., the country's only commercial manufacturer of airplane floats. A year ago it was confined to a single one-story building covering about half a block. Today it occupies a second plant of almost the same size. Within a few weeks it will add a third factory building, three stories high and providing a total of 131,000 sq. ft. of floor space.

The greater part of Edo's growth has resulted from miltary and naval orders, but some expansion would have been necessary anyway in the lightplane category, where demand has increased greatly this year. All over the country, operators of lightplanes and small commercial craft are awakening to the advantage of using floats instead of wheels. The lightplane float business shows promise of reaching a new high this summer. Already the plant has turned out six sets, in the first four months of 1941, for every set made in the corresponding months of 1940.

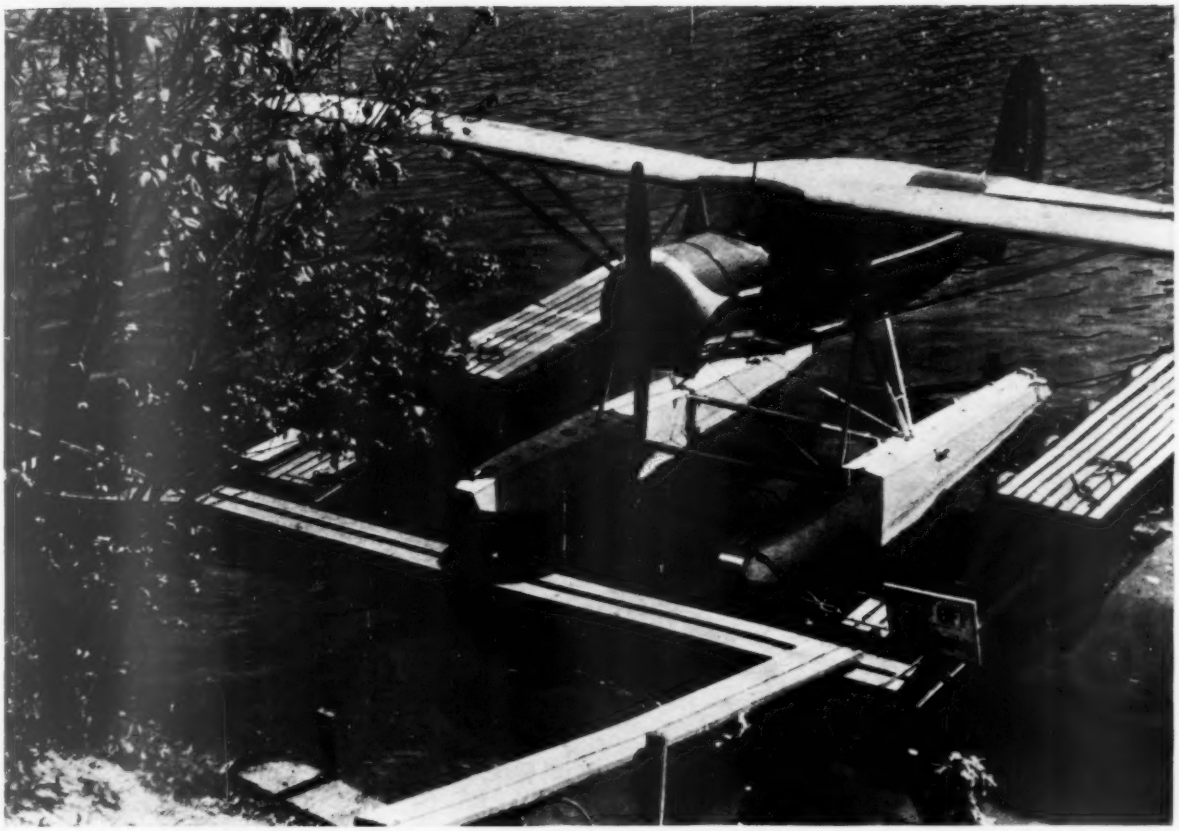
After 17 years of pioneering, working and experimenting to perfect their product and to sell the idea of using float-equipped planes to the public, Edo officials now see their prophecies of many years ago—that the average man's plane of the future may well be a seaplane rather than a landplane—apparently headed toward fulfillment. Most important reason for the new interest in float-equipped aircraft, perhaps, is the recent increase in U. S. seaplane facilities through CAA and the NYA cooperation. A seaplane now can fly almost anywhere its owner desires without getting too far from a base where gasoline, storage facilities and mechanical help are available.

A second important factor is float-equipped planes' ability to come down safely anywhere a landplane can—and in some places where a landplane can't. Sandy or marshy ground—even a furrowed field—can be taken in stride by the sturdy modern floats, which simply act as skis and brakes combined. Seaplanes almost never nose over on such terrain, but simply skid to an easy stop. This means that the average pilot can fly a plane carrying floats cross-country with greater ease and less worry that he could fly the same plane carrying wheels.

A third and frequently deciding factor is the increasing difficulty of finding a usable landing field. Congestion and costs on most airports have forced many owner-flyers to consider developing their own facilities. Usually it has proved less expensive to equip a plane with floats and to use any available strip of water for take-offs and landings than to secure a piece of land and convert it into an airport.

Experimentation and development, now somewhat curtailed by large Government orders, always kept Edo engineers busy on such ideas as this Waco's amphibian gear.

The amphibian gear was developed further to include these nose skids. Idea later was shelved.



Floats used on this Fairchild are heaviest standard types made by Edo. Set weighs 377 pounds.

Finally, there is the CPTP. Because many trainees are getting their first air experience in float-equipped lightplanes, the demand for them has increased. The Government approves such training and allows operators who provide it a bonus of about $50 per pupil above the usual fee. Some large training units are offering seaplane instruction exclusively, believing that anyone who learns to handle a seaplane can transfer his knowledge to landplane operation.

The first seaplane flight was made in September, 1912. Beckwith Havens, now a Roosevelt Field Fairchild distributor, took a Curtiss pusher, equipped with a single makeshift wooden pontoon costing about $900, across Long Island Sound and back in about half an hour. "Becky" carried John R. Dilbert of East Orange, N. J., with him as passenger. The strange craft frightened guests at a swanky lawn party when it dropped unannounced out of the sky on the Sound's east shore.

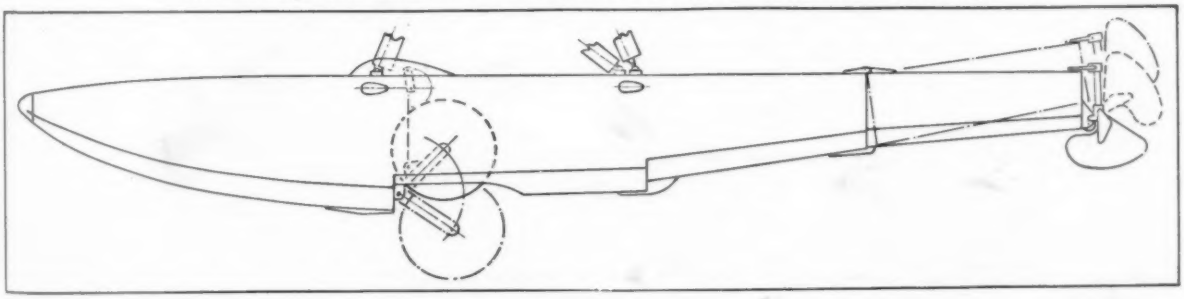
Since then a lot of water has gone under aircraft floats. In 1924 Earl Dodge Osborn, a flyer with a special liking for things nautical, began float experiments. A year later the Edo Company (its name derived from his initials) was set up to produce them for commercial use.

From the then-customary frail, bulky, wooden boat-like structures that swelled up and increased in weight whenever they got wet, Osborn and his associates streamlined aircraft floats into trim metal units of enormous strength, tough enough to skim over water at from 60 to 100 m.p.h., yet light and small enough not to drag when the plane is in flight; so carefully balanced that they may be attached to any plane without upsetting its equilibrium, yet so ruggedly built that no rip or tear can make them lose their buoyancy entirely.

Osborn started in a small frame workshop of 4,000 sq. ft. Today that workshop constitutes one small corner of the Edo plant and the initial handful of craftsmen has grown to more than 1,000 employees. The plant now produces a full line of 26 aircraft floats, ranging in displacement from 1,140 pounds up to 20,000 pounds for a set of two, and in price from $600 up.

The lightest standard float set, Model 1140, weighs about 150 pounds, including strut and water-rudder installations, and sells for $595. This model is the type used on Piper *Cubs* and other lightplanes.

Here is working drawing of experimental amphibian flotation gear pictured on the opposite page. Note the hinged rear section. Wheels are retracted into thickest bulkhead sections before step.



This float-equipped experimental U. S. Navy Vought-Sikorsky SB2U-3 dive bomber is undergoing rough-water tests. Navy has big orders for new catapult planes.

Among largest floats ever built by Edo were those for this Bolivian Curtiss "Condor" bomber. A similar set was designed and installed on an airline's tri-motored Ford.

The heaviest standard float set made is Model 2880, which weighs about 377 pounds and retails at $2,665. It is used on planes in the Fairchild "24" class. Heavier float equipment, built on order, has weighed up to 2,300 pounds and cost up to $6,750. Such float sets were built for several Martin bombers. Whenever necessary, Edo engineers design special jobs for unusual craft, such as those used for exploratory flights, polar expeditions, or other similarly unique assignments.

Manufacturers who wish to equip a plane with floats first send Edo engineers as much information about the craft as possible. The engineers are interested not only in such details as the model number, type of engine used and wing area of the ship, but also in the position of its center of gravity when fully loaded, the height of its propeller axis above the landing-gear fittings and the diameter of its propeller. Their aim is to fit the flotation gear onto the plane with as few major changes as possible, using existing landing gear attachments whenever feasible.

When they have obtained the necessary data the engineers recommend a general layout, indicating the size and type of floats needed and the best method of attachment. If this meets the manufacturer's approval they prepare a final blueprint, make a stress analysis of the proposed float struts and draw up a table of forces acting on the attachment points. Then they proceed with a detailed design which, when approved by the manufacturer, becomes standard for that plane. The floats are tested carefully under operating conditions. Usually this is done by the manufacturer himself, with the help and advice of Edo experts. In all cases land and water gear are interchangeable.

New aircraft types demand new flotation equipment. This alone keeps a number of experimental workers busy. Their job is complicated by the many important considerations to be kept in mind. The float must be easy to install or remove. It must provide a step for the pilot's and passengers' use when entering or leaving the ship. Its moorings must easily be picked up or its anchor dropped.

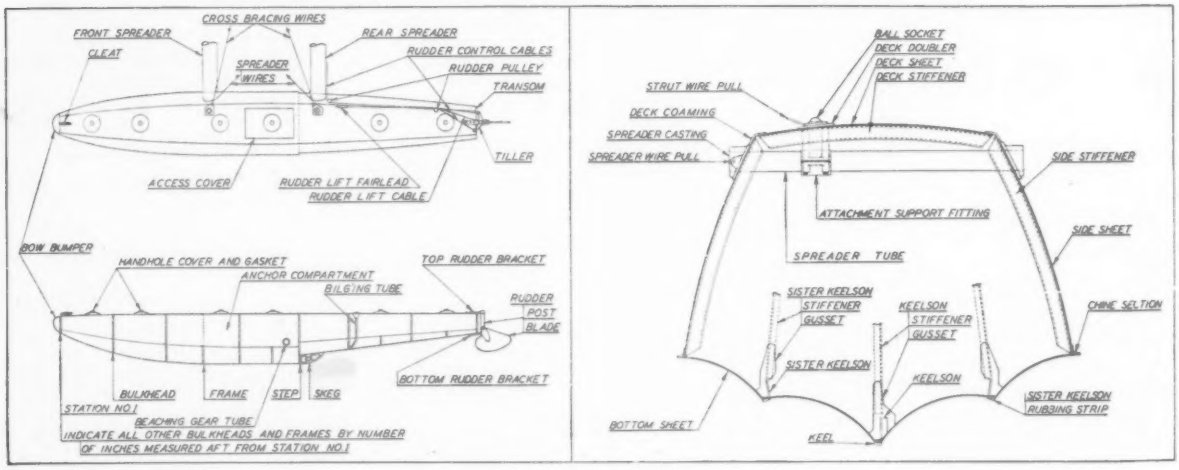
The float's shape must be such as to provide as little high-speed drag as possible and to throw the spray down, away from the propeller. Its keel must be strong enough to carry the plane's full weight when skidded out on a ramp. Its balance must be worked out carefully so as not to move the plane's "center of mass," where passengers ride most comfortably.

A trip through the bustling little factory on the edge of Flushing Bay reveals how all these factors are handled by assembly-line methods. The Edo shop is divided into two parts: the detail and assembly departments. The former makes parts and completes all possible subassemblies. The latter turns out and tests the finished floats.

Nearly all metal parts used in the construction of floats are first heat-treated

(*Continued on page* 80)

Three-view drawings below show construction details of floats. Note unusual cross-section design.



WE PILOTS WANT SERVICE!

by EDWARD CHURCHILL

It's hard for the private flyer these days to get service at the nation's airports. A plane owner tells his plight and makes constructive criticisms that might help.

Good mechanics are scarce at most of the country's airports. In most cases plane owners do their own work. Airlines could help by renting out unused hangar space.

A regular contributor to this magazine, Mr. Churchill also is a private pilot and plane owner. Although the opinions stated in this article do not necessarily coincide with those of the editors, it is generally believed that hangar and servicing facilities in most sections of the country are far from satisfactory. However, readers who have found conditions other than described in this article are invited to describe their experiences.—Ed.

NOT long ago my plane was in a small western city. I arrived at the field at 1:30 in the afternoon so that I could get off the ground and to my destination before dark. On reaching the hangar I asked for my plane.

"We're very sorry," I was told. "The airliner will be in in a few minutes. It parks right outside the hangar. We have to keep the doors closed."

By pleading, I got the hangar doors open and my ship some distance down the field. Then I asked for gasoline.

"The trucks will be tied up until the airliners leave," I was told. "We'll give you gas when we can."

I finally got it. Then, checking with the airport manager, I was given clearance after the last liner left. I got off the ground at 3:30 instead of 1:30. A tail wind cut a possible four hour jaunt to around three hours and 20 minutes and I landed at sunset—just under the wire.

At this same field, a few months before, I requested a good grade of "30" oil. I was told that oil for lightplanes was not stocked and that "60" was the lightest grade available. This place is not only a resort city encouraging tourist trade, but also a ferry point for lightplanes flying west. And, to top it all, the man who is trying to promote tourist trade is a well-known pilot and flies his own plane!

I give this as one example of the lack of service I have encountered in the course of four years' lightplane flying. Here's another instance:

On coming into a California-Arizona border town I selected the Government intermediate air field. Taxiing up to the Government meteorological building, I requested gas. The operator on duty pointed to the wall telephone, suggested calling three companies. I called all. The first had no trucks; the second was just too busy; and the third would "get it out after a little bit." The gas came 45 minutes later in three dirty five-gallon cans. The boys who brought it had no change, so my 15 gallons cost me $5. I had to pour it myself and crank my own ship. At this point, the Department of Commerce man accosted me.

"Did you see that big hole out in the center of the field?" he asked.

"You mean that one in the runway about eight feet across and two feet deep?" I asked.

"That's it. You didn't hit it, did you? There's brush all around it."

"No, I didn't."

"That's good. The last feller in went into it and broke his prop. I'm going to have to put a red flag in it some day."

At a west Texas field, also an east-west factory delivery ferry stop, I came over with one-third throttle, stalling at 41 m.p.h., and not believing my eyes. Here was a Department of Commerce intermediate field covered with rocks the size of grapefruit.

"Well," I told myself, as I pulled the throttle the rest of the way back and waited for the ensuing shock-pounding, "I have to have gas—."

Forty-five minutes later I got the gas. I went over the field inch by inch, found the smoothest stretch, listened to my shocks hit bottom until I had enough speed to stall off, which I did, ducking the nose when I was a couple of feet up to gather speed. On reaching El Paso, I commented sourly on the field.

"Bust anything?" an attendant asked.

"No."

"Then you've nothing to crab about. Most everybody does."

Later, in talking to an ex-Army pilot now with the CAA, I mentioned this field's condition. He laughed.

"I remember once when 27 of us Army pilots got forced down there," he said. "Fourteen of us were able to get off

again. Thirteen had to have repairs. Three went on their backs. Two ships weren't able to leave for more than a week."

These three instances are not isolated. Ask any cross-country pilot and he'll add a few more tales of lack of service. Powder rooms for the ladies are conspicuous by their absence. Most pilots say they starve while flying cross-country because of lack of restaurant facilities. You can recognize a lightplane which has been flown cross-country; the neck leading to the gasoline tank will be bent to one side—bent by the pressure of gas nozzles inexpertly and lazily held by attendants. Still other attendants have bent the top of the cowling leaning the nozzle on it.

A Texas commercial operator received a telegram from a spot 300 miles away, reporting that one of his ships had been forced down. He turned to me.

"That's the gas he got at—," he said. "There's been water in that tank for months."

Today, everybody talks about aviation booming after the war. The private flyer is predicted as coming into his own. I'm trying to point out that if he is, the CAA, municipalities and private owners of fields must start a program of encouragement. Obviously, one thing that is needed is a suitable stock of gasoline and oil, properly serviced by trained attendants.

Another program which wouldn't hurt at all and wouldn't cost much would be the erection of sanitary facilities on all fields. I don't mean modern plumbing. I mean four walls that would at least give privacy to the gentler sex. Installation of a pay telephone in a waterproof box, suitably marked, at each field, also would help. Notice that I said *pay* telephone. There might not be many nickels at first, but as traffic picks up, it'll pay off. Inside the box could be, as an additional service, a card listing the gasoline companies and taxicab companies. In the absence of the latter, the numbers of a few people who wouldn't be averse to doing a little hauling at a reasonable price. There's nothing quite so depressing as standing on a deserted field beside an infrequently used road waiting to send a message into town.

One airline has issued courtesy cards to private pilots. I'm very well acquainted with a number of this company's officials, but have never asked for such a card and never have received one, simply because I don't believe it means much. The airline policy toward private flying must be regulated by the officers of the company or even by a national aeronautical association and a definite policy —one of extreme encouragement— adopted toward the man with his own plane. First, it's a business builder for the airlines, as courtesy will be repaid by patronage. Second, as a long-run policy, it will aid manufacturers.

What can an airline do?

It can, through its own operators, place its weather facilities in the hands of the private flyer who lands at an airline field. Second, it can give terrain and route advice. Third, it can aid, rather than hamper, gasoline and oil service. Fourth, it can provide overnight storage when overnight storage is available. The average private pilot would be very happy about housing his ship at a moderate fee. If a hangar is being used extensively by an airline, with liners being pulled out and replaced frequently, a private airplane would get into everybody's hair and should be barred. On the other hand, when huge hangars are infrequently used and when storage permission is denied, rage rankles in the itinerant private flyer's breast.

I stored at San Antonio in a hangar where Braniff planes were stored and serviced. Each day, somebody washed a Braniff airliner and the stuff that was used dripped on my ship. It turned from red to gray. But I didn't mind. It would wash off, and did. In the meantime, I was under cover.

If we are to have increased flying after the war, hangar operators must get onto their toes. The main abuses today are the damaging of ships when moving other ships around in hangars—I collected six patches, a broken navigation light and a few other scars in three months—and the permitting of practically anyone to handle, poke at and get into the private plane. Garage men don't allow anybody who drops in to sit at the wheels of privately owned cars; careless parkers who continually dent fenders are fired.

Base hangars, to be attractive to potential plane owners, must be kept clean, have decent sanitary facilities, a soft drink vending machine, chairs on which to sit, an available telephone and competent hangar boys. Luckily, my present storage is exceptionally good. I'd recommend it to anyone. But such places are few and far between and I've been the victim of dented wheel pants (the kid just had to jump on them to see into the cockpit), radio dial buttons twisted off and other sad experiences, including the "second-handing" mentioned a bit above.

Another problem we must face if private flying is to expand after the war is suitable stocking of spare parts and intelligent servicing and repair of ships sold. The manufacturers, distributors and dealers today operate on the theory that their airplanes never wear out.

I had trouble with the hydraulic brakes on one of the lightplanes I owned. When I stepped on the pedals the hydraulic fluid leaked out of the flimsy storage can, ran down the fire wall and took the paint off the belly. Several "home" remedies were tried, none availing, when I returned again and again to my distributor.

"Haven't you ever had this kind of trouble before?" I asked.

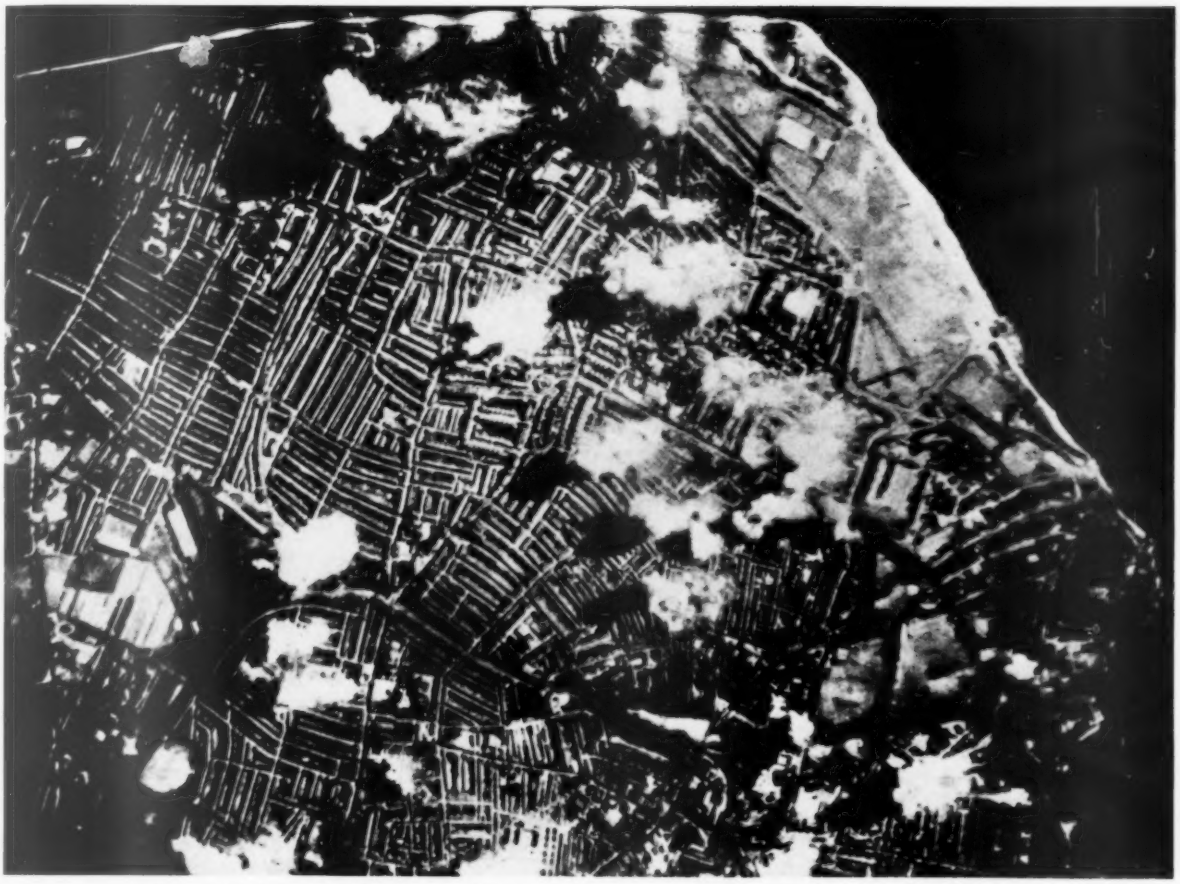
"We did on one ship," admitted a company employee.

"How did you fix it?"

"We didn't have to. We sold it to a guy from Arizona and never heard from him again," was the amazing reply.

(*Continued on page* 88)

Huge airline hangars, like Pan American's at San Francisco, could house lightplanes in "extra" space.



German bombing raids, like this on a British seaport, were possible because of British unpreparedness.

Should We Learn From the Germans?

by Representative
FRANK C. OSMERS, Jr.
Congressman from New Jersey

The author discusses his views on the relationship between Army and Navy airforces in the light of the experience of World War II.

Rep. Frank C. Osmers, Jr., 33 years old, two-fisted and athletic, is one of New Jersey's famous air-minded Congressmen. As he indicates in this article, he is a staunch advocate of the creation of a general war college to coordinate existing separate establishments. The opinions expressed in this article are the author's and not necessarily those of this publication.—Ed.

F. C. Osmers, Jr.

AT this moment of world crisis it is disturbing that the nation must rely almost solely upon land, sea and air commanders who, by training and experience, presumably are capable enough in their respective branches, but they remain essentially specialists.

Virtually every venture which it is conceivable we might have to undertake for hemisphere defense would demand the close cooperation of every element of American striking power. As never before, this country's future depends on the readiness of the Navy, the Air Forces and the Army to operate as a powerful, unified team. How many officers are qualified to call signals for that defense team—or any substantial element of it?

Before it is too late it would seem imperative to take prompt steps to remedy a weakness which is glaring in the light of the portentous Nazi conquest of Europe.

As much as six years ago there was clear recognition in Germany that the war, whose clouds even then were beginning to lower, would be a conflict of three dimensions—land, sea and air. It could not be fought victoriously by com-

(*Continued on page 78*)

Jacqueline Cochran is a firm believer in No. 13. She flew her racers to fame carrying that number, also had it on her personal ship. Note the "13" in plane's license.

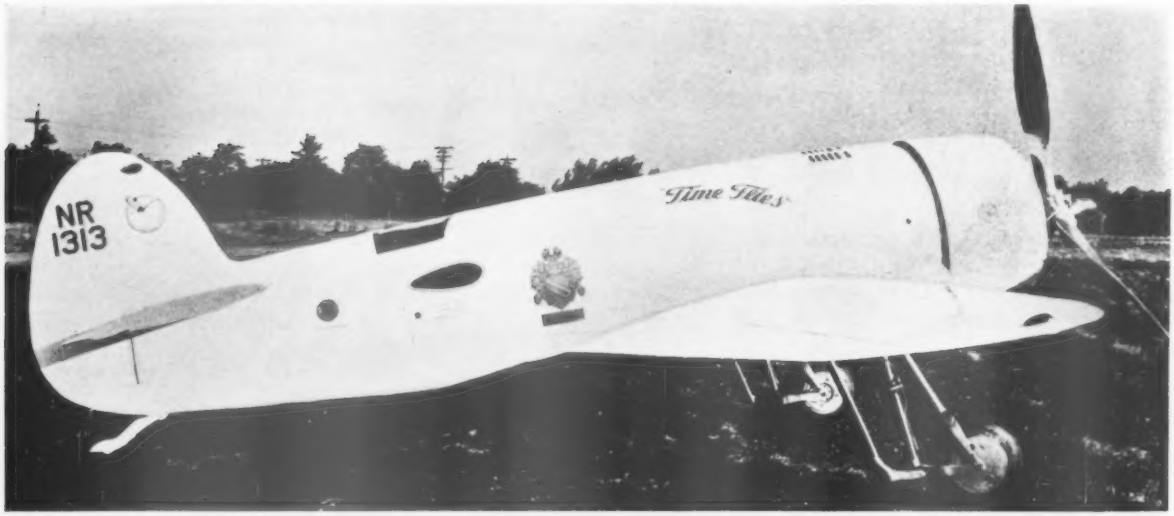
Casey Jones also raced No. 13, has carried pilot's certificate No. 13 for many years.

Pilots Are Superstitious

by KENNETH BROWN COLLINGS

Even the most modern pilot is a sucker for a rabbit's foot or some other "good luck" gimcrack. And don't dare photograph him before a take-off!

Frank Hawks was another believer in "13," had his ships licensed that way. He died in a 13-less plane.



This RAF cadet, now training in the U. S., "adopted" this toy bear, probably will carry it through the war.

This lion cub added tremendously to Roscoe Turner's fame. He never flew without it. It finally grew up to become dangerous to carry in his plane.

Kenneth B. Collings

WHAT breeds flying superstitions? What makes them endure? Well, here is one aviator's opinion. In Europe, the aerial machine guns are chattering again, six or eight and maybe an aerial cannon besides, where there used to be two. You have that many guns and so has your enemy.

For defense, a fighting pilot has a lot of gadgets practically unknown to his predecessors in World War I. He has armor, a parachute and self-sealing gas tanks.

But so has the other fellow. And while superior strategy may determine the outcome of war, when it comes to a question of who survives an individual dog-fight, there's no use arguing: luck plays a big part. So you finger your rabbit's foot, take a reassuring look at the little worsted doll dangling from your instrument panel and make sure that the skull cap made from your sweetheart's left silk stocking is firmly in place beneath your flying helmet.

Except that it was a product of the last war—which has continued over into this—no one knows where the left silk stocking superstition originated. Yes, it has to be a left stocking. Early French and Belgian pilots wore them as mufflers; the British commonly cut them into skull caps. All believed implicitly that they were instrumental in warding off enemy bullets. Then the Americans reached France, to differ about the method of wearing them, but to share the superstition.

American pilot Guy Kelcey is eloquent about the results. In his case, it was his wife's stocking. He never flew without it in his helmet. Never did, still will not and after 23 years of flying he has a record of never being touched by a bullet or breaking anything on an airplane more serious than a wing skid.

The case of American Navy pilot Frederick E. King illustrates the exact reverse and the manner in which dire results were reconciled with the superstition.

King's stocking was a lavender silk creation with white clocks up the sides, given him, as he claims, by the best-looking brunette in all Nantes. The point, however, was that the stocking itself was so beautiful he hesitated to cut it into a skull cap. That was precisely the reason he was wearing it as a muffler while tooling his seaplane along the coast of France looking for German submarines, as well as why he almost got killed.

This is the last article ever written by Mr. Collings. Shortly after it was finished—early in May—he was reported lost at sea with 10 other American flyers en route to fly for the British. A veteran flyer, Mr. Collings flew with the Marines in the World War, barnstormed for several years after the war, flew for Pan American Airways, traveled the world and, for 10 years, had been known as a capable and prolific writer, especially on aviation subjects. The one thing the 40-year-old flyer feared most was water.—Ed.

Without warning the stocking whipped from around his neck, flipped aft in the propeller blast, caught in the tail. It jammed the controls and forced King to land 10 miles off shore in waves the size of young mountains. The heavy seas almost wrecked the plane and made clearing the tail hazardous. According to Navy regulations, that job should have fallen to the crew chief. But as King himself puts it:

"Can you picture me asking a hard-boiled Navy chief petty officer to shinny back in all that pounding water to rescue a lavender silk stocking?" King did the job himself and was almost drowned in the process. After that, he was cured—but not of the superstition!

He was cured of the brunette: it was obvious that the lady was not faithful!

Some of this war's flying bugaboos are easier to trace. They come right back here to America. The clearing house was America's National Air Races to which, all during the middle 1930's, it was customary to invite outstanding pilots from all Europe. The visitors met our pilots, heard the airport gossip and in some cases were elected to American flying clubs. When the war broke out, English *Hurricane* pilots at Hendon and German *Stuka* flyers from Templehof were sharing with Steve Reich and Swanee Taylor and a host of other Americans the belief that it is sheer suicide to be photographed in front of an airplane just before the take-off.

How did that particular superstition originate? The early American barnstormers invented it and thereby sold many a ride. Their antiquated crates, landing at county fairs and in cow pas-

British airmen, like the pilot of this "Hurricane," are highly superstitious about carrying favorite charms, insignia or whatever they have found to "bring them luck."

tures, were the first airplanes ever seen by thousands of Americans. While some spectators bought tickets, others were timid. The latter frequently asked the pilot to pose with them for a picture so they could go home and boast of the ride they lacked the nerve to take.

"Not a chance!" retorted the pilot. "Do you want to jinx me? Pictures after the ride, never before—five dollars, please."

While accumulating new superstitions, aviators have by no means abandoned the old. Some pilots are as bad as seafaring men when it comes to starting a new venture on a Friday. Many go in for numerology. One famous test pilot refuses to fly a plane with a number in which the numeral 9 appears. Another avoids 7. So many dislike 13 that at least one manufacturer commonly skips the number—substituting 12-A—when grinding out planes for the present conflict.

But to Casey Jones and a few others, 13 signifies good luck. In his pioneering days, Casey raced No. 13. When the Government took over control of flying he asked for license No. 13, which he received and still has. When Roger Q. Williams took off to fly the Atlantic bound for Rome, he carried an old deputy sheriff's badge numbered 13. He was not sure whether the badge or the broken handle of an old magneto contributed by Capt. Sam Capini did the trick—but he arrived safely.

Jacqueline Cochran's fondness for 13 started by accident. In the MacRobertson race to Australia she drew it from a hat. Then she was handed the 13th entry in the 1937 Bendix Trophy race, in which she flew to third place. (Another pilot took the plane over after the race, landed upside down in a frog pond and promptly removed the number.) But Miss Cochran's luck continued good, so just before the next Bendix race, when another pilot tried to get No. 13 away from her, she refused to part with it. That year, in competition with some of the best men pilots in the world, she won!

Ken Porter, American war ace, is one of the many pilots who will not light three cigarettes on a match. Just before a take-off in France, he accepted the first light and two of his squadron mates ignored his protests to take the other two. They were promptly ambushed and killed on a suicidal raid in which Porter did not participate because a conked motor prevented his leaving the ground.

Duke Krantz, famed aerial press photographer, avoids walking under ladders around airports. He shares Ted Hebert's objections to black cats. When the old Gates Flying Circus was in New Orleans, Krantz almost threw Clyde Pangborn through the windshield of his car while trying to avoid a black cat's path. But the cat got across in front of them—and an hour later the outfit's wing-walker was killed.

Jim Waugh, veteran of the last war, disliked black cats until his sister sent him one cut out of velour. Waugh, who was part of Allenby's army in Palestine, had been in numerous air battles, but had scored no victories. So he sewed the black cat to his flying helmet to change his luck—and promptly shot down two Turkish Taubes. Then he returned to England and the helmet disappeared.

Waugh refused to fly until is was found. His commanding officer called him a superstitious fool. While they were talking, Waugh leaned lightly against the vertical fin of his battle-worn plane. The fin was so rotten it came off in his hand. A take-off would have been fatal.

But for Annette Gipson—who once avoided certain death by hitting a panicky male flying student who had frozen to the controls over the head with a fire extinguisher—the still-prevalent doll superstition might have died. It undoubtedly originated with Ninette and Rintintin, the engaging little twins constructed of bright strands of worsted and carried by half the aviators in France. In the postwar years Miss Gipson took to collecting lucky dolls. Soon she had hundreds of them, headed by a 24-inch veteran named Jenny. Most of them rode with her in one of the Ruth Chatterton air derbies, a circumstance which led to the later mortification of Pilot Jimmy Drummond. When Drummond, flying Miss Gipson's plane back east, suffered a forced landing in a mid-western corn field, he went looking for tools. To the boundless amusement of the assembled farmers, the only thing which six-foot, broad-shouldered Drummond pulled out of the tool compartment was—dolls!

Roscoe Turner used to indulge in the most common of superstitions, the rabbit foot.

Current war regulations have put a crimp in the superstitious practice of carrying living mascots aloft. Probably that is just as well. Previously, the only restriction on the variety of animals toted along seemed to be the door size. Roscoe Turner's parachute-equipped lion cub was already famous when a tribe of Andean Indians presented the Pan American-Grace pilots working out of Lima, Peru, with a huge Angora goat as a good-luck offering.

Not that the boys wanted him; they didn't. But they had ferried salt to the Indians and now the Indians reciprocated by invoking the blessings of the ancient gods of the high cordillera and loading the ceremonial goat abroad. Everyone was greatly impressed—except the goat. He registered his opinion of the proceedings by climbing out at Lima and knocking the pilot flat. He has been an ill-tempered airport menace ever since, yet the boys cannot make up their minds to get rid of him—not so long as they

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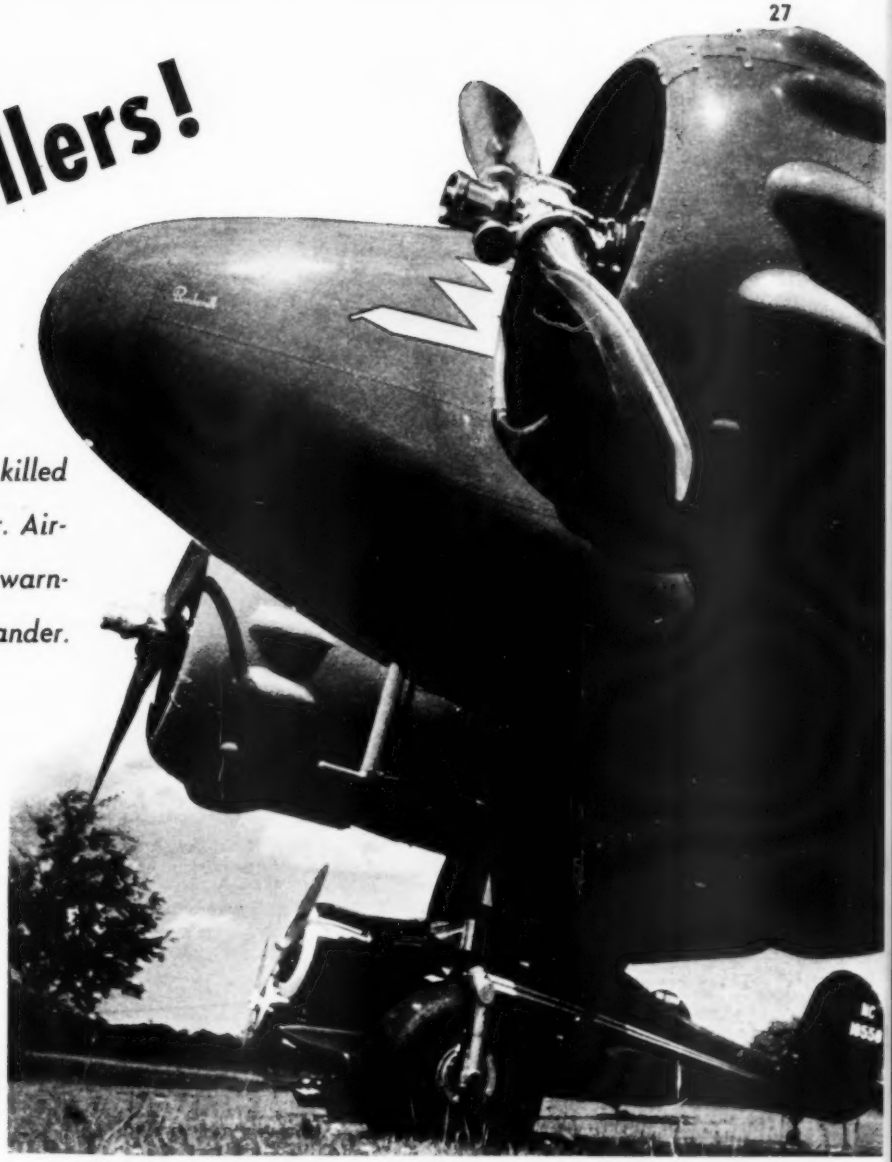
Beware of Propellers!

by DWIGHT SWAIN

Forty-one careless persons were killed or injured by propellers last year. Airport operators should heed CAA warnings and caution flyer and bystander.



Leading source of danger at airports is the idle propeller. Visitors must be warned not to "give it a twist" out of curiosity; the ignition switch possibly might be on.

AN airplane propeller's gleaming blades, almost invisible at hundreds of r.p.m., can play the role of death's scythe all too tragically if the unthinking bystander wanders within its reach. During 1939 and 1940, 41 people—one every 18 days—were killed or seriously injured by propellers. Many of these were passengers or spectators, which is all the more reason airmen should do their utmost to prevent such accidents in the future.

Ten of the 41 injuries mentioned were fatal, the other 31 severe. Their danger is emphasized in the Civil Aeronautics Board Safety Bureau's report. "A propeller rotating under power, even at slow idling speed, has sufficient force to inflict serious injury to anyone it strikes," the bulletin comments.

How did these accidents happen? Analyzed, they fall into four general classifications. In 18 cases—44 per cent of the total—someone walked into a whirling propeller. In seven instances this proved fatal; in the remaining 11, serious. The second group consists of persons injured while swinging a propeller to start an airplane engine. These numbered 15—36 per cent of the total—and involved one death and 14 serious injuries. Next came six individuals struck by moving aircraft. Two were killed, four severely hurt. They made up 15 per cent of all propeller accidents. The final classification covered persons injured when propellers flew off. There were only two instances—five per cent—of this. Each caused serious injury.

"Every one of them [the accidents] was preventable," the Safety Bureau reports. "Each accident represents at least one person killed or severely injured. The casualty list includes not only airmen and passengers, but also a high percentage of innocent bystanders; men, women and children. The danger of a whirling propeller is universally recognized and regulations have been carefully prepared to minimize this hazard. However, all such accidents, though not wilfully so, are mostly the result of thoughtlessness or carelessness on the part of some individual."

Surprisingly, almost as many flyers walked into propellers as did spectators or passengers—five, as compared with six and seven, respectively. "One student, handling the throttle in starting, jumped from the plane because he thought it was getting out of control," says the bulletin. "He ran into the propeller, with fatal results. In another accident, a ground man was struck while removing wheel chocks. Others occurred when a student and an attendant walked into propellers and when a student stepped into the propeller while walking around the aircraft to change seats with his instructor."

Six of the seven passengers killed or hurt were getting out of planes. One was getting in. "It appears that the excitement incidental to flight confused the passengers," comments the Bureau, in pointing out the necessity for alertness by personnel. Spectators who wandered into propeller paths ranged in age from 20 months to 62 years. This type of accident ran up 70 per cent of the total fatalities recorded.

Commenting on the second classification—accidents from swinging propellers to start motors—the report states: "Spinning a propeller is dangerous under any circumstances. It not only requires skill and concentration, but the safety of the operation is coupled directly with the cooperation of the man handling the controls in the cockpit. Carelessness or incompetency on the part of the aircraft

personnel is likely to result in serious or fatal injury. A loose ground wire would permit the engine to start, even though the ignition switch was in the 'off' position; and improper timing might result in the engine 'kicking back', causing the propeller to jump violently in a direction opposite to direction of rotation. It is extremely important for the man swinging the propeller to know how to stand and how to handle a propeller while swinging it.

"Here are some examples of how these accidents happen: . . . . Pilot turned the switch prematurely due to a misunderstanding of signals . . . . booster magneto not grounded, engine started before pilot was ready . . . . student in cockpit failed to close throttle after engine started and airplane nosed down, shattering the propeller, a piece of which flew up, striking and seriously injuring the instructor . . . . engine backfired, breaking the wrist of student who was swinging the propeller . . . . wheel chocks were on icy ground and when the engine started, the plane moved forward . . . . an airport attendant started an engine with no one at the cockpit controls and, when the aircraft jumped the chocks, he was struck by the propeller . . . . a 14-year-old boy tinkered with and pulled through the propeller of an airplane in dead storage. The engine started and the boy lost six fingers."

Propellers of moving aircraft killed two people and injured four. Among cases commented upon by the Bureau was one in which a pilot swung the propeller of his ship, leaving a man who knew nothing about airplanes at the controls. The man, confused, pulled the heater control instead of the throttle when the engine started. The ship ran down and killed a boy aged seven. Planes under pilots' control taxied into people in two cases. In another instance a pilot started his ship's engine by himself, with no one in the cockpit and no chocks under the wheels. Uncontrolled, the plane swung off down the field, the propeller striking and killing a girl spectator. Summarizing this group of accidents, the bulletin declared: "They are all the result of sheer negligence . . . all could have been prevented with reasonable care."

Two propeller accidents—and consequent injuries—resulted from faulty maintenance. A boy's arm was chopped off in one instance when a plane's engine was started and the propeller flew off. In the second instance the arm of a ship's pilot-owner was badly hurt when the propeller left the shaft.

Can propeller accidents be prevented? The Safety Bureau says *yes* and places the responsibility for doing the job squarely on the shoulders of all airmen. Here are its recommendations:

"The pilot must at all times assume the direct responsibility for safeguarding his passengers, his students, other airmen and the public against the dangers of propellers and of airplanes in motion on the ground.

"The propeller is difficult to see when in operation and the non-professional

(*Continued on page* 106)

Edgar Bergen Contest Winners Announced

Mr. Bergen selected the winner recently at Flying and Popular Aviation's offices.

WALTER H. MORRISON of Oakland, Cal., E. L. Stephenson, Chicago, Ill., and Glen Hartig of Evansville, Ind., are the first, second and third place winners respectively in the Edgar Bergen couplet contest introduced in FLYING AND POPULAR AVIATION in April. The contest closed May 13.

The winners were selected, according to Bergen, while he was flying from Hollywood, Cal., to Chicago by airliner. Aboard the airliner Bergen let a pilot, stewardess, and fellow passengers help select the winning verses. In this way, he said, persons from every walk of life were given an opportunity to judge the entries.

"There were many laughs," Bergen says, "but in most cases the more humorous couplets were the ones which imparted the best moral lessons."

The contest was sponsored by Bergen, through FLYING AND POPULAR AVIATION, with the idea of getting important flying rules into verse so as to help pilots remember them.

Morrison, a veteran private flyer who lives at 540 Alcatraz Ave., Oakland, Cal., receives $100. Second prize of $50 goes to E. L. Stephenson, an aviation insurance executive, of 175 W. Jackson Blvd., Chicago, Ill., and the $25 third prize was won by Glen Hartig, R. R. 8, Box 178, Evansville, Ind.

A few of the winning couplets were:

Think before you drag that field!
Is that darned antenna reeled?

The Know-It-All, 'tis truly said,
Can never rest until he's dead.

You may think you're pretty hot
That shut-off gas valve shows you're not.

Ashes to ashes and dust to dust,
The Devil's best tool is control cable rust.

Short of gas . . . overcast
Flew on top . . . flags half-mast.
Through dirty weather he said he'd get.
A year has passed. He ain't there yet.

Hiram Horseplay, full of zest,
Zoomed a cow. They're both at rest.

Aerobatics at low altitude
Is the epitaph of a multitude.

A long white beard will never grow
On one who flies low and slow.

Stretch a glide and spin her in
And get a lily under your chin.

Morticians get a rake-off
On many a steep take-off.

The cowboy who takes off straight up,
Is heading for the last round-up.

There's hardly a pilot who is now alive,
Who tried to hop eight in a plane built for five.

Breathe a sigh for Sally Sloop,
From 500 feet she looped-the-loop.

A long and steady take-off climb
Is good insurance every time.

Lion tamers and "daredevil aces"
Are likely to land in some very tight places.

Those receiving honorable mention were: Pvt. Robert Baylor Anderson, Wheeler Field, Honolulu, T. H.; Brad C. DeVall, Jr., 5542 Columbia Pike, Arlington, Va.; Fred Goldenberg, 139 72nd St., North Bergen, N. J.; Daniel B. Hufnail, Reading, Vt.; William H. Champlin, Jr., Box 1714, Rochester, N. H., Theodore L. Soffel, 2978 E. 196th St., Bronx, N. Y. C.; D. D. Cahn, 515 N. Akard St., Dallas, Tex.; Roswell Burrows, Saginaw, Mich.; Capt. Harry W. Elkins, Ft. Davis, C. Z.; Andrew M. Lockett, Jr., 429 Carondelet St., New

(*Continued on page* 90)

Aviation's Traveling Salesmen

Visible airstream hitting wing of model shows audience how and why planes stall.

by CHARLES W. SCHLIPF

These Franklin Institute staff men have told aviation's story to 250,000 people with 39 flight principle demonstrations.

WE'RE aviation's traveling salesmen. During the past three years we've presented the thrilling story of flight —"From Magic Carpet to Rocket Ships"— to more than 250,000 people scattered from New Hampshire to Virginia and from the eastern tip of Long Island to Detroit. Before we're through we expect our own "magic carpet," a custom-built truck which carries our complicated equipment, to transport our program of aerial education and entertainment into every state in the union.

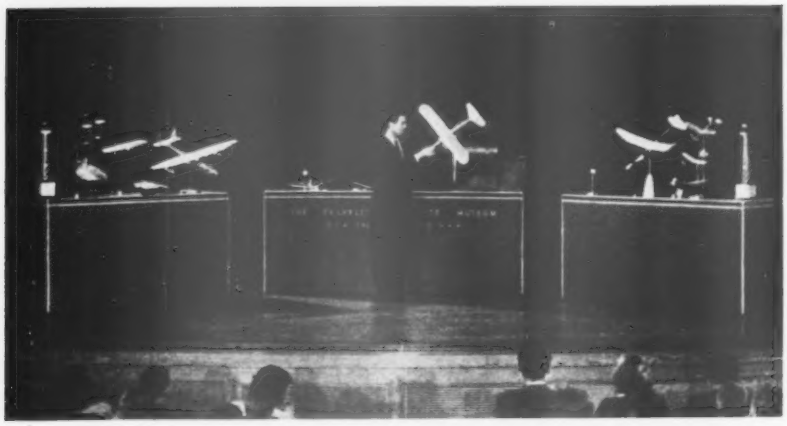
But we're getting ahead of our story, a saga that begins back one night four years ago in the lecture hall of The Franklin Institute at Philadelphia. The audience, that eventful evening, was made up of Aero Club of Pennsylvania members. The idea was to present aviation's story simply, convincingly and, above all, interestingly. To that end 39 dynamic demonstrations illustrating the principles of flight were linked into a unit that traced aeronautics from the earliest prehistoric flying monsters up to the potentiality of practical rocket ships.

So successful and effective did this preview prove that it was decided to put it on the road under its present name: "From Magic Carpet to Rocket Ships." A grant from the Carnegie Foundation provided funds for truck and equipment. In December, 1937, the show was ready for its first trip. Ralph H. McClarren, associate director of aeronautics at The Franklin Institute, was in charge. With him was C. T. Ludington, president of the Aircraft Owners and Pilots Association, who took the writer along as a very green assistant. Since that first trip—to the University of Rochester—we've given the show before more than 250,000 people.

The number of persons in our audiences who've never been closer to an airplane than the airport fence continually amazes us. For the aeronautical well-being of our nation that condition must be remedied. I don't contend that the traveling aviation show is the sole solution; other influential organizations should carry on where we leave off. However, I do believe that when a mixed audience, aged eight to 80, responds to our presentation with a vow that the oldsters are going to fly for the first time; the youngsters will build models and form clubs; and those in their 'teens and 20's will unite to bring a training program to their town—then we've taken a long step in the right direction.

Our show takes 1½ hours. It's designed on the idea that theory should be linked

Carnegie Foundation grant gave funds for show's custom-built truck and equipment.



Left-hand table holds flying models; center, wind tunnel and flying models demonstrating all known modes of flight; right, scale models. Equipment weighs nearly a ton.

with a series of simple aerodynamic demonstrations which are so easily understood and fast-moving that the audience never has a chance to lose interest. To this end there is a complete presentation of flight fundamentals, divided into six subjects: flight in nature, methods of flight, the why of flight, visible air flow, the how of flight, types of heavier-than-air flyers. A large order? Yes, but each unit has its full complement of action demonstrations in sequence.

This is an ideal time for you readers to take a seat in the audience while my partner, Lyle Redrup, and I outline the full-length show. As the curtain is drawn, you see before you on the stage nearly a ton of equipment, well-lighted and set up as dramatically as possible. There are three large lecture tables. Those on the left and right have flying and scale models respectively. The large center table has a wind tunnel and various flying models to demonstrate every known mode of flight.

After a short introduction telling the show's purpose, a peculiar-looking contraption comes to life and our ornithopter flaps its way over your head to portray bird-type flight. But what a poor imitation it was! Ultra high-speed movies of pigeons and humming birds taking off then are shown. A series of experiments follow the pictures. They demonstrate other methods of flight—man's conquest of the air via the lighter-than-air technique; controlled lighter-than-air flight, using a flying, helium-inflated dirigible; the sailplane and glider; and maple seed, boomerang, autogiro and helicopter models, to illustrate the rotating-wing flyers.

Our next demonstration shows why an airplane flies. This is vividly portrayed through Bernoulli's theories by which forces are determined when a fluid is in motion. A ping-pong ball, piece of paper, glass funnel and wing section are used. A model kite and airplane are flown in the wind tunnel to indicate the difference between kite and curved surface wing lift.

Now comes the all-important question of streamlining. Again using the wind tunnel, we make some of the air visible. Several objects of different shapes are placed in this visible airstream. They range from the flat plate around which air meets the greatest resistance, to the perfect streamline, exemplifying the ideal form for the air to follow. The true meaning of streamlining hardly can be illustrated more graphically than by this fascinating method.

Perhaps the most significant demonstration in the visible air flow series is that of the slot effect—how the birds use it and how the Handley-Page slot works in the airplane wing. A scale model of a high-wing monoplane is placed in the visible airstream. The flow is directed over the wing's top surface. The ship's angle of attack gradually is increased, the stall is reached and the air suddenly breaks away from the top surface. With the aid of a small auxiliary wing placed above the leading edge of the main wing, the air that has broken away is deflected downward and over the top surface again. Thus, the original stall has been eliminated and the main wing has retained its lifting force.

To illustrate the purposes of an airplane's various component parts and their usefulness when efficiently designed, a model is assembled and flown while in process of construction. For example, the wing is allowed to flutter to the floor. From that stage, means of weight distribution, longitudinal, directional and lateral control are gained by the addition of fuselage, stabilizer, fin and dihedral angle of the wing, in that order. A power plant and landing gear are added to complete the machine and the assembled model is flown around the hall.

One of the stiffest obstacles to hurdle when planning the show was overcome in the next and last series of demonstrations. How could the various types of ships be defined clearly when such considerations as wing and power loading, cruising range, ceiling, speed and maneuverability were involved? We settled it by using eight scale and flying models. Four solid models of 1/30th scale are used in conjunction with four flying models to demonstrate the weight carrier or payload, endurance type, speed and acrobatic variety. The flying models have been built as closely to each other's scale as possible. They enhance the educational value of the show by demonstrating the flight characteristics of these different types and also constitute one of the entertainment highlights.

No demonstration of this nature would be complete without the display of a model gas engine. Flying students and model enthusiasts expect it and the adults who have never seen one marvel at the little "power-house" in action. We haven't learned how to fly a gas model indoors above the heads of hundreds of people, much to the disappointment of some of the youngsters. We probably will stick to our own safe way that has worked so well. With the motor mounted atop a three-wheeled streamlined table and revving as any good model motor should, it is released on the side of the stage, the propeller thrust being sufficient to pull the assembly across the stage and the slipstream to blow a banner painted with red letters spelling, "The End."

The show's minor features have been revised constantly until now it resembles the original only in subject material. In every city, town and village, the show has proved to be a hit and hundreds of letters have been received commenting upon the entertaining method of presenting a scientific subject.

Unlike the average one-night stand unit, we do not pack up hastily and clear out when the show is over. Our traveling schedule is arranged to allow us to remain overnight in the town where we are showing. Thus, we are able to invite all who wish to come up on the stage to inspect our equipment and ask questions relating to the show and to discuss aviation in general. The success of this policy, plus the general excellence and popularity of the show, accounts for the surprising number of repeat performances we have presented during the past two years.

We have been asked repeatedly what we consider the primary purpose of this traveling demonstration. That is a difficult question to answer unless we consider the purpose of The Franklin Institute. It was the first organization in the country to devote its full resources to the popularization of the sciences for the benefit of the public. In our Museum building there are over 4,000 demonstrations; many may be operated by the museum visitors by merely pressing a button. Unfortunately, those in distant towns and cities seldom have an opportunity to visit this wonderland of science. For that reason, four years ago, provisions were made to put a portion of these demonstrations "on the road," so that those unable to come to us might be benefited. A traveling chemistry show was first organized and quickly gained widespread acceptance.

One year later, by popular request, the traveling aviation show was planned and its popularity is still growing. While carrying the name and good will of The Franklin Institute far and wide it also delivers a message which the aviation world is eager to send throughout the land. Thousands in the past have watched and listened; thousands more are awaiting their turn.

END

FLYING RANCHER

Pitchfork Ranch is largest antelope range in U. S. Lockheed (above) helped to speed stock shipments.

by HOWARD OSBORNE

Out west cowboys have turned pilots. This rancher uses airplanes to watch herds on his 200,000 acres.

ONE of America's last great independent stock barons, Charles J. Belden, probably is most widely known for his outdoor photography, even though his camera is only a hobby. But among flyers—

"There's a cowman," they'll tell you, "who knows how to use an airplane!"

Airmen don't say this because Belden is a pretty good pilot, which he is, but because he uses his wings in a hard-headed, business-like fashion. Winter or summer, his ship enables him to watch the workings of his 200,000-acre domain, Pitchfork Ranch, some 50 miles south of Cody, Wyo., as no cattleman of the old west ever was able to do.

Does the feed along Little Rawhide Creek seem a bit scanty for the cows grazing there? An hour's flight and Belden can tell his foreman just where to move the herd. Is there doubt as to the whereabouts of one of the sheep bands? The flying rancher probably saw it and swooped low to catch the herder's reassuring wave. Would a range crew working far from the home ranch like fresh batteries for their portable radio? (Shades of old-time cowpokes!) Belden's plane lands near the branding fires and that night the waddies listened to "Information Please?"

Or perhaps the San Diego Zoo, a thousand miles away, wants half-a-dozen young antelope. Belden delivers them in 48 hours, as fresh and frisky as they were at home in Wyoming.

Incidentally, Belden's answer to the question: "What class of license do you hold?" is characteristic. Here it is:

"I have had about 1,500 hours in the air, mostly in the cockpits of private ships, including a Ford tri-motor, Lockheed *Electra*, Ryan and a few others. Also some Link Trainer time. I do not have a private pilot's license because I have been too busy flying to learn to fly."

The antelope is North America's fleetest and most beautiful wild animal. Belden photographed these on his ranch from a low-flying plane.

These eight pronghorn antelope were flown 1,800 miles —faster than any group of animals had traveled before.

Belden has cattle and sheep on ranch, in addition to antelope. Barns and corrals can be seen in this airview. Markings atop barn direct pilots to landing area.

The Pitchfork range, deep in the Big Horn Basin, is home to probably the country's largest herd of antelope. Recent estimates by Belden and game wardens place the total at more than 4,000, with the number increasing steadily under Belden's conservation policies. The antelope is North America's fleetest and, in the rancher's eyes, most beautiful wild animal. Zoos and game preserves, public and private, for years have come to Pitchfork Ranch for antelope. Until development of his aerial shipping technique, Belden hesitated to undertake delivery, since the shy, sensitive animals did not "ship well" and mortality in transit was high.

Some years ago, however, Belden and Bill Monday, Cody pilot, decided to try an airplane delivery. Monday, now ferrying bombers for a West Coast airplane factory, then was known as Wyoming's "flying cowboy." They had a request from the zoo in Hamburg, Germany, for a pair of young antelope. Belden was afraid they wouldn't live under the strain of a long train trip to New York, then a voyage across the ocean, followed by another train trip.

Pure inspiration led them to look up the zeppelin *Hindenberg's* transatlantic schedule. Within 60 hours two youngsters from Wyoming were nibbling German grass! Since that precedent-smashing delivery, more than 200 antelope from Pitchfork have been flown all over the United States without a single fatality. Belden says the animals take to flying wonderfully; that they couldn't be shipped as successfully any other way, no matter how carefully they were handled.

From the air the rancher is able to watch the movement of various bands closely. Baby antelope, captured a few hours after birth, are taken to the home ranch for domestication. They are milk-fed from quart bottles fitted with specially-made rubber nipples until they wean themselves. Belden built several racks about the home ranch, designed to hold the bottles at just the right height and in a natural position; but the women on the ranch are so taken with the four-legged babies that virtually every one becomes a pet and is hand fed. Chief pamperer is Belden's daughter, Annice.

Not a single animal ever is shipped away from its home range without the consent and supervision of game wardens. Belden is a conservationist first, a supplier to zoos after that. He never profits from this activity.

When it is time for a pronghorn—as the youngsters are known—to be taken to a new home, he is tucked into burlap sack so that he will lie still in the plane—one of Belden's or a chartered ship. A supply of filled bottles is taken along.

Actor Wallace Beery flies his Howard to Belden's ranch to hunt wild game.

Probably the fastest trip any antelope ever made—from Pitchfork to Lake Placid, N. Y., in 12 hours—was that of eight pronghorns delivered to Dr. Phillip G. Cole's 1,500-acre private game preserve at Lake Placid last summer. Dr. Cole has known Belden for many years. Their mutual friend is Justin Dart, head of the Walgreen drug store chain and pilot-owner of a twin-engined Lockheed "12." An exchange of letters, arrangements with wildlife authorities, and the Dart Lockheed was dispatched to Pitchfork with Capt. Jimmy Allen of United Air Lines at the controls. The next morning eight unsuspecting pronghorns were bundled into sacks and placed aboard, with Belden to watch over them. At 16,000 feet most of the way, they raced into Chicago, where a refueling stop was made for both plane and animals.

Before nightfall the frisky youngsters were regaining their land legs in the Cole estate's freedom.

The trip merely confirmed Belden's belief that flying is the one sure way to transport game animals without undue strain upon their nervous systems. The higher they fly, the better, he has found. It is cooler and the air usually is smoother—both favorable factors. Lack of oxygen apparently affects them not at all.

Charles J. Belden.

But antelope shipping is just an occasional sideline with Charlie Belden. Cattle and sheep raising are his main activities; they give work to more than a hundred persons on the Belden payroll alone. To get an idea of why flying means so much to Belden and Pitchfork Ranch—a string of rented or borrowed ships are used—try to visualize the size of the property:

Its 200,000 acres cover about the area of Long Island, N. Y. The Pitchfork "spread" dates back to the six-gun toting, range-war days of the 80's. Hay and grain fields, tucked away here and there and cultivated simply to provide winter feed for the stock, total more than 4,000 acres!

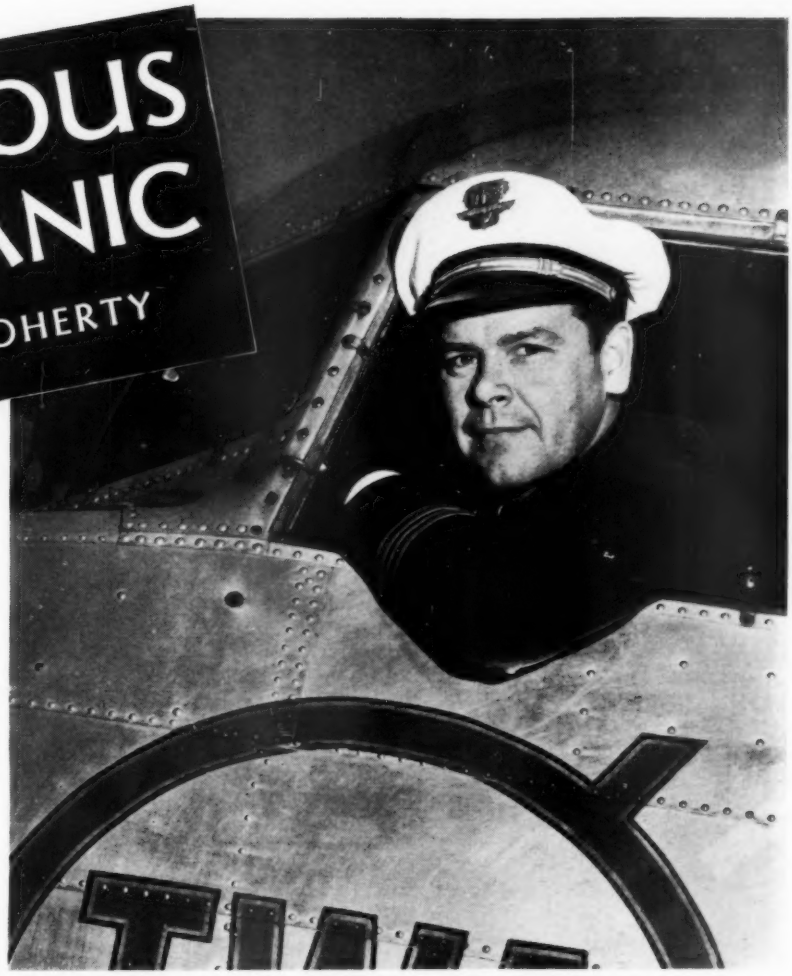
About 20,000 sheep range the hills and valleys and many thousands of pure bred cattle graze the meadows. There are two principal ranch headquarters, a guest ranch and nine "working" divisions, each with its own foreman.

The first ranch of the present holding was the original Pitchfork, established along the upper reaches of the Greybull River in 1879 by one Otto Franc, reputedly a titled Hungarian expatriate. The other part was once the Z Bar T, established a few years after the Pitchfork. Today the Pitchfork headquarters

(*Continued on page* 82)

AMBITIOUS MECHANIC

by E. JAY DOHERTY



With experience that includes 10,000 hours aloft to his credit, Orm Gove has been promoted to the post of TWA flight superintendent at La Guardia Field.

When a man's so interested in aviation he will throw up a good selling job to work free for an airline, he's sure to succeed.

ORM GOVE jokingly says he got his first taste of flying the day he was born when he took a trip with a stork and he's been flying ever since. At the age of 16 he soloed. At 20 he booted away a good job selling food products on the West Coast to work for Western Air Express at old Vail Field in Los Angeles.

There was no job in the aviation industry for him, but he went to work anyway. After 10 days of voluntary labor for the airline he had laid two miles of three-inch waterpipe and his supervisors were so astonished they put him on the payroll—as an apprentice mechanic whose main job was to wash the grease off cowlings. Financially this was an awful setback, but as Orm says, "I was spending all my spare time hanging around airports washing cowlings and doing odd jobs to pay for my flying time. And you can't spend 16 hours a day leisure time on your hobby and do justice to your job in the other eight. So I quit the selling job to devote more time to my real interests." When he wasn't messing around the airline he did dirty work for the Army as an enlisted man in the National Guard 115th Observation Squadron at Griffith Park, Los Angeles.

One might think from his meager beginnings in aviation that Gove was awfully anxious to fly. He was—but he had greater things in mind than just flying. Instead of setting out to make a lot of money as a salesman to finance his flying time he chose the hard way because his interest in aviation was so intense that he must know *all* about it. He wasn't—and isn't—gunning for a particular job in aviation; he's so interested in the business that he knows it from the ground up and at 32 is one of the really accomplished executives in the air transport industry.

Consider this: At an age when most men are just getting settled in their jobs Orm Gove is senior flight superintendent at New York for one of America's largest airlines; he is fifth in seniority as captain in the eastern region, being outranked only by the division superintendent, the chief pilot and two others. He owns his own airplane and in addition to his duties as flight superintendent he puts in 40 hours a month as captain of a transport plane—half as much time as the pilots who make a career of flying.

It all goes back to his school days at Hollywood High when, like many others, Ormond M. Gove got the flying bug. Unlike his fellow students Gove knew what to do about it. By doing odd jobs at airports he paid for a few hours instruction which completely sold him on the business. Graduating from high school, he went to work as a salesman. His salary paid for some private flying instruction at the Santa Ana airport from Eddie Martin and Hap Russell. He soloed in 1925. One day he had a chance to purchase an OX Travel Air which had discouraged its owner from further flying by plowing up a plot of land with its nose. Orm bought the plane at a ridiculous price, slaved over it, got it into flying condition, built up flying hours and resold it at a good profit. With the money for the Travel Air he picked up a Waco. The owner of this plane, too, was willing to part with it for a minimum consideration because an unfortunate experience had dulled his enthusiasm for flying. Gove bought gas and oil with his own labor as a grease monkey to keep the plane flying.

At that time there were no airlines. The principal means of making money was by barnstorming and Gove did not care for that. A practical man, he dislikes the spectacular. He believes in aviation as other men believe in insurance. So he kept his selling job and devoted himself to flying, dismantling and remaking his plane when-

(*Continued on page* 68)

FLYING STARTS ON

All CPTP ground instruction has been standardized by CAA.

Heart of any pilot-training program is its ground school. A typical C.P.T.P. ground school is at Washington's National University.

PRACTICAL aeronautical information, garnered from old-timers' years of experience, is the reward of ground course students at the hundreds of Civilian Pilot Training Program classes throughout the country. What most people don't realize is that you needn't be a CPTP student to take the course. You don't need even a lot of money, for Uncle Sam pays the biggest part of the bill.

Today, 15,000 men and women are learning aviation via the ground school route. A typical course is that of Washington's National University, where District of Columbia students acquire information on topics ranging from meteorology to parachutes. Admittedly, they don't get flying's thrills. Their consolation is that it's a lot more effective to learn their subject from the ground up than to regret lack of knowledge while plummeting earthward.

Monday is navigation night at National, with Henry L. Knight, formerly of the U.S. Army Air Forces, instructing. A West Pointer, Knight is attorney-examiner for the Civil Aeronautics Board. He's a sharp, thorough teacher, in the military academy manner.

Wednesday is Civil Air Regulations night, with Samuel E. Gates, chief of the international division of the CAA's bureau of economic regulation, at the controls. Gates assisted in writing the original Civil Air Regulations. He likes to puzzle the class with trick questions, loves a legal argument about the regulations and always gets his point across.

Friday night has been devoted to airplane operations, with R. A. Neale, flying instructor in the secondary course at Congressional Airport, in charge. His course having been completed, Friday now is meteorology night. B. C. Haynes, associate meterologist for the U.S. Weather Bureau, instructs. Author of the CPTP manual, "Meteorology for Pilots," used in 400 colleges, he was formerly

THE GROUND by R. A. SEELIG

Many students attending CPTP ground schools are doing so because of their interest in aviation as a profession, not just for the flying experience. Instrument training, like that at the University of Cincinnati (above), and engine theory (at Ogden, Utah, below) are invaluable to the professional aviation specialist of the near future.

meteorologist and dispatcher for United Air Lines. He also taught at Boeing School of Aeronautics.

Civil aeronautics officials say this 90 hour primary course is worth $75. The secondary course of 126 hours is worth more. Students of the CPT program get the primary course free or for not more than $10. Others have to pay varying amounts, as their college specifies, but usually not more than from $10 to $30. Those outside the CPTP pay $10 at National University and feel as though Uncle Sam is giving away $5 gold pieces for a dollar. Since appropriations for ground school work, as well as other parts of the CPTP, have been reduced as compared with last year, it should not be taken for granted that the ground course will continue to be available under present arrangements, however. Those interested, therefore, should get into a CPTP ground class as soon as they can.

The Civil Aeronautics Administration does not advertise the course, so unless you are a CPTP student, you have to hunt for a class and make a definite effort to get into it. The best way to locate one is to ask for information at any airport that gives flying instruction. The spring primary course was concluded at most schools in May or June. The fall primary course started in Sept. and will continue for 12 to 15 weeks. The program calls for 24 hours of instruction in navigation, 24 in meteorology, 24 in Civil Air Regulations and 18 in airplane operation.

While CPTP students, who get the course free are inclined to undervalue ground training, the course is considered by the CAA to be indispensable. Any student can be "washed out" for failure to pass any one of the ground school subjects. What is the value of the course in actual flying? Neale, who has had 1,000 hours in the air, answers:

"Class room flying saves time and trouble in instruction aloft. Of students of equal ability, those with ground school training are far ahead of the others."

In the class at National, 20 are CPT's and five are not. Incidentally, three who started with the class—one a CPT—dropped out because the going was too tough.

In a way the National University class is not typical, because the instructors, as indicated by their official titles, are exceptional. Instructors throughout the country are competent, however, although not all are specialists. In many places one instructor teaches all four subjects. All have to pass a stiff examination to obtain a ground instructor rating in each subject to be taught. Requirements are covered by Part 51 of the CAR. Each instructor must have practical as well as theoretical knowledge of his subject.

Students in this particular class at National answered a questionnaire which helps throw some light on what sort of persons are taking ground school work. All are college men, although only 10 are undergraduates. In the class is an attorney of the Civil Aeronautics Board, two census clerks, three FBI fingerprint classifiers, one FBI reader, a bank bookkeeper, a salesman, five government statistical clerks, an airline employee, a stenographer, the secretary to a U. S. Senator and several students who did not give their occupations. Not all have white-collar jobs; one waits on tables to pay his expenses at law school. Four students are majoring in law, the others in Government, agriculture, economics, history and mathematics and physics.

In the class are two girls and both say they would like to serve as non-combatant flyers in the military service. They are Government employees.

Most of the men in the class are in their early twenties, but the age range is up to about 40. The upper age limit for CPT's is 26. Of 16 who answered a questionnaire as to whether they would like to get into the military service, nine said they would, five would not and two reported, "optional." Of 18 who answered the question: "Do you intend to go into commercial aviation?", eight said "yes" and 10 said "no." One answer was: "Never look a gift horse in the mouth."

CAA officials say large numbers are attending ground schools throughout the country because of an interest in aviation other than in piloting. In this particular

class, however, all but two or three are flying. The fact that some non-flyers take the course indicates broadening interest in aviation. People who may never sit at the controls of any airplane want to know what makes them stay in the air. They want to know what flyers mean when they say a plane is "clean" or "hot" or "spinproof".

Students were asked how they liked the ground course. Typical of the comments was this: "Excellent training under competent instructors. Program a little too rushed when one attends classes three nights weekly, plus five days a week, and tries to find time to study."

One of the CPTP student's chief problems is how to get a few winks of sleep now and then. Sleep is highly recommended for aviators by CPTP manuals, but it's pretty hard in practice to leave a class at 10:45 p. m. and get out to a distant airfield fresh as a daisy the next morning at 6 o'clock. Some of the boys strive to accomplish that miracle. Their idea of the world's finest vacation is to stay in bed some day around the clock.

Without going into detail, here are the subjects covered in the CPTP primary ground school classes: navigation by pilotage and dead reckoning, a speaking acquaintance with radio navigation, fundamentals of areodynamics, use of parachutes, line inspection of an airplane, something about instruments, airplane structures. Civil Air Regulations in detail, especially air traffic rules; reading and interpretation of weather maps, air mass movements, cloud forms and their significance, estimating ceiling and visibility, meaning of teletype sequences, what information to obtain about the weather before making a cross-country flight and how to obtain it, thunderstorms and icing conditions.

Meteorology Instructor Haynes was asked, "What practical value does ground training with regard to weather have for the pilot? What use does he make of it in the air?"

"The pilot with ground training in meteorology is better able to interpret weather phenomena he encounters while in the air than is someone without that training," he replied. "Without ground instruction, a pilot may be inclined to experiment. He may try to see what will happen if he gets near various cloud forms and may end in trouble. A man trained on the ground is more than likely to alter his flight plan properly to fit weather conditions than one who has not been so trained."

Haynes thinks students are more inclined to accept instruction from experts then they used to be, perhaps because they read the accident reports. Nevertheless, some of them don't take kindly to safety instructions. They think it's overdone, don't see why they shouldn't fly through an overcast once in a while, sans instructions and sans an instrument rating. Doubt has been expressed that it really is impossible to determine the attitude of a plane by feel when flying blind.

Navigation sinks in better than the

(*Continued on page* 100)

FROM HEADQUARTERS

by Lieut. Col. HAROLD E. HARTNEY (A. F. Res.)

Harold E. Hartney

WASHINGTON, D. C. Three thousand families pour in here each month to help finish up the two jobs which concern every man, woman and child in the world: to run down the international bandit that has run amuck and to stabilize civilization afterwards.

Suddenly this city has become the center of the world, if not the capital of it. Internationally it draws foreign diplomats like a lodestone. Nationally it would appear that there is only one big cash register in this country and top men in every business come here to put their hands in its drawer.

* * *

Few of these Congressional investigations pay the piper. If handled by an expert on public relations they can make headlines and take a couple of people off relief, but by and large no good legislation follows. The one exception was that of the Royal S. Copeland Committee on Air Safety. On investigating airline accidents, it soon became obvious to the late senator that "dough" was the trouble. Again money, or the lack of it, was the root of the evil. To be financially sound and business-like the airlines needed a financial status to follow through on the economic status the Air Commerce Act of 1926 gave them. Copeland's committee followed through and backed Sen. Pat McCarran's CAA bill. The lines and airways obtained more funds. The solution of airline safety was complete, the public better served.

All this was the direct result of a Congressional investigating committee. It did something which an agency of the administration could not do. Possibly the solution is never to form a Congressional committee unless it is for the purpose of doing something which cannot be done by an existing standing agency of the administration.

Any congressman or senator who conducts a Congressional committee with re-

(*Continued on page* 102)

A competent attorney as well as a veteran airman, Lieut. Col. Harold Evans Hartney (Air Force Reserve) started his flying career in 1915 with Britain's Royal Flying Corps. He transferred to the American Air Service in 1917, continuing a distinguished career in military aviation. Among other decorations he holds the D.S.C., the Silver Star, Purple Heart, French Legion of Honor, Croix de Guerre (three palms), Italian Silver Medal for Valor and the British War Medal. Since resigning from the Army in 1921, Lieutenant Colonel Hartney has served as technical adviser for many aeronautical concerns, has done a great deal of aviation work in Washington where he now lives.—Ed.

At a recent Washington reception William B. Ziff (center), publisher of FLYING and POPULAR AVIATION, was congratulated by G. Grant Mason (left) and Harllee Branch, CAB officials, after receiving the International League of Aviators' Diploma of Honor.

Are You FORCED LANDING CONSCIOUS?

By JOHN R. HOYT

Proper technique, explained in this article, would have prevented 1940's 41 crashes in forced landing practice.

THE engine in your plane is not apt to fail you, because of modern methods in manufacture and upkeep. But during 1940 there were 41 aircraft accidents which occurred while simulated forced landings were being practiced. Almost every crash indicated faulty judgment on the part of the pilot such as undershooting, overshooting, or striking obstructions.

One might say, "Why practice forced landings? Isn't a forced landing bad enough without practicing one?" That seems logical enough on the face of it, but the point is this: "How will a pilot be able to make a good forced landing unless he first has rehearsed himself in the correct procedure?"

The simulated forced landing, moreover, is a part of the Department of Commerce's CAA test. There can be no doubt that such a test is necessary. All pilots know a safe, reliable, forced landing procedure must be perfected before a pilot is considered competent. There is always the possibility of fatigue, part failure, fuel shortage, or distance miscalculation. No engine will run forever and for that reason every pilot knows that he may have a forced landing eventually if he continues to fly.

But most of us are not "forced landing conscious." For that reason a good instructor drills us continually on what to do when the emergency really arrives.

There are several good rules to learn before mastering the technique of forced landings. If these rules had been followed, the 41 accidents in 1940 attributed to simulated forced landing practice would never have occurred.

The first three rules are simply these:

1. Don't stall.
2. Never stall.
3. Don't ever stall.

Fifteen of the 41 accidents resulted primarily from a stall close to the ground! That is over a third (36.6 per cent) and far too many. They occurred because the student attempted to stretch his glide on approaching the field. Here are some typical examples as given by the Safety Bureau of the Civil Aeronautics Board:

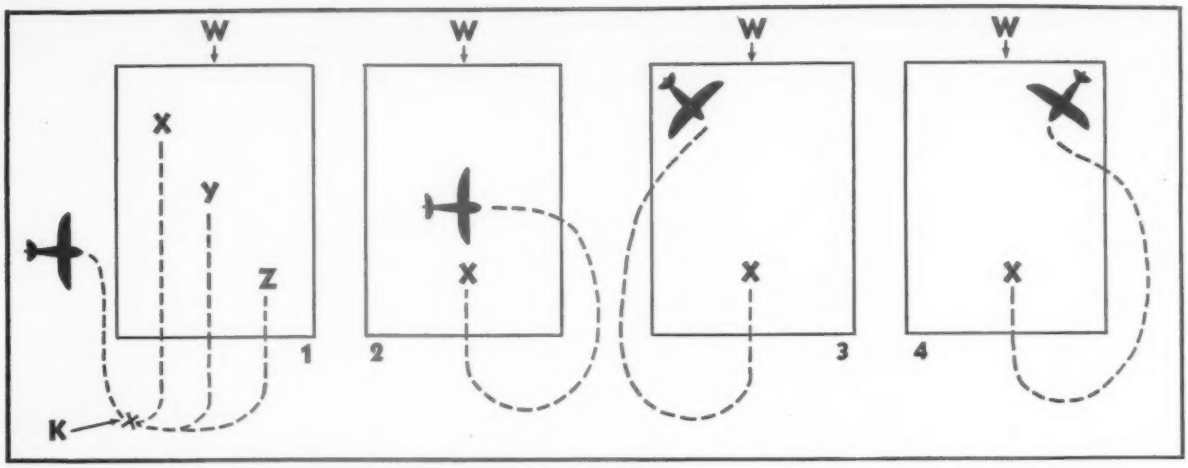
"1. Student stalled his airplane at 100 feet altitude during a simulated forced landing. The instructor was unable to make complete recovery before the airplane struck the ground with the left wing, left wheel and the nose, resulting in fatal injury to the instructor, serious injury to the student and major damage to the aircraft.

"2. While practicing simulated forced landings, a plane was observed flying at about 75 feet altitude and making a left turn of 180° when it stalled. The plane struck the ground nose first, resulting in fatal injury to the instructor, serious injury to the student and washout damage to the plane.

"3. Instructor was giving student simulated forced landings. A flat turn was made at an altitude of 50 feet and the plane stalled. Instructor applied throttle too late to prevent plane from striking ground."

It has been rightfully said by some instructors, "Don't *ever* try to stretch the glide! You can hit a brick wall in a normal glide and walk away from the crash, but if you pull up the nose and spin in, you'll hit the ground so hard they'll have to carry you away."

To prove this statement, examine a few facts. Each crashed plane (12 of them!) was coming in for a landing on a simulated emergency, when the engine failed to respond. The pilots maintained their normal glide, landed, and walked away from the accident. Eight of the 12 were



Eight possible approaches for low-altitude emergency landings, described by author, are pictured above and at bottom of page.

not injured at all although 10 of the planes required major overhauls. Of course, the fact that 12 (29 per cent) of the 41 accidents occurred due to undershooting and lack of attention to the engine during the glide, is a serious fault. It is the result of not being *alert*, of not being able to observe several things while doing a single task. Here are a few examples of how it happens from the CAB report:

"1. While attempting simulated forced landing, student undershot. The engine failed when the throttle was opened and a forced landing was made in the brush. This resulted in major damage to the plane and minor injury to the student.

"2. In attempting a simulated forced landing, the instructor took the controls as the student was about to undershoot. Throttle was applied but the engine failed. Landing gear caught in trees, causing plane to hit the ground, nose first, resulting in major damage to the aircraft and minor injury to the occupants.

"3. In attempting a simulated forced landing, student overshot field, applied throttle too fast, causing engine to load up. Plane stalled and crashed, resulting in serious injury to pilot and major damage to aircraft."

Note that in example No. 3, the pilot allowed the plane to stall and was badly hurt. In the previous examples both pilots glided in normally and suffered only minor injuries.

Further proof that a crash from a normal glide will not result in as serious an injury as a crash from a spin is given in the remaining 14 accidents. In 10 of these (25 per cent) the planes were flown into obstructions, resulting in major damage to the aircraft and minor injury to pilots. It is obvious that forced landing procedure must include emphasis on alertness — watching constantly for trees, power lines, and obstacles. Here are a few examples of how *not* to do it:

"1. The instructor was demonstrating a simulated forced landing when the propeller and landing gear struck a power line, causing the plane to veer to the left and crash, resulting in major damage to the aircraft.

"2. Student undershot landing area, plane hit top of trees and nosed over into the ground, resulting in the washout of the aircraft and minor injuries to the pilot."

In discussing these accidents, the Safety Bureau stated: "The value and importance of simulated forced landing practice for the student pilot is well known to the professional pilot. However, the method by which this instruction is conducted is sometimes questionable. It is evident that the first step in decreasing the number of accidents of this type lies with the instructor . . . the instructor must be on the alert and not allow the student to stall the airplane or to continue too far when undershooting. . . ."

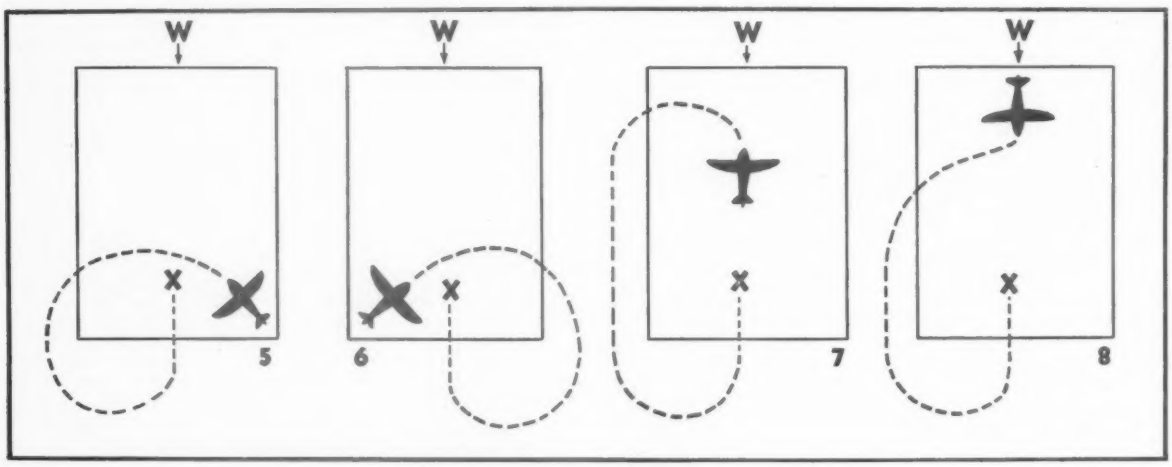
Suppose that you wish to become forced-landing conscious and to prepare yourself with the proper training in order to cope with the emergency when it comes. In Figures 1 to 8 are several possible approaches to emergency landings, containing the rudiments of forced landing procedure from a low altitude (800 to 1,000 feet). It pre-supposes that wind direction, terrain and field have been selected and that there is nothing left but to shoot the field.

The first simple rules are these:

1. Nose over—get a normal glide.
2. Maneuver downwind from the field using the shortest route and without turning your back on the field.
3. Get into a field if there is one, *always* using a forward slip.

Examine Figure 1, which is the sim-

(*Continued on page* 98)



FLIGHT COMPUTERS

by Lieut. T. C. GILLMER

New problems arising in flying today make the flight computer a "must" in every pilot's kit!

THE vast number of dead-reckoning problems arising in modern flying is elevating the flight computer to an important place in the pilot-navigator's kit.

Commercial and private flying, with their off-course and alternate airport problems; military aviation with its interception, scouting and search; the closer alliance of military and civil aviation, with the mass instruction of new pilots —these all are contributing factors. High speeds bring an even more pressing need for rapid calculations in flight. And where there is no rapid means of learning these instruments and no royal road to knowledge of their capabilities, pilots must be made to feel at ease with them.

The only sure means of making a lasting friendship with these little pieces of plastic is in the knowledge of their construction. To reconstruct the plotted problem on their faces and recognize the source of each part leads ultimately to pleasant confidence and almost automatic solutions. The purpose of flight computers and calculators should not be confused, however. This often happens on the grounds that they are thought to be simplifiers or "magic brains." Actually, they are no more intelligent than the user.

A thorough knowledge of the principles of dead reckoning, especially those involving the triangle of velocities, is required for those who would use this instrument. After the pilot is thoroughly grounded in the principles of the velocity triangle, he is still incapable of efficient manipulation of a calculator until he recognizes the hidden presence of the velocity triangle in the maze of vari-colored grids in the computer face.

True, he may commit various rules and procedures to memory and operate the instrument by rule, but the results can never be reliable. Not until the lines on the various faces separate themselves, and each becomes a definite part of his problem, will the instrument begin to give the answers as fast as he can make the set-ups.

After understanding the most elemental wind drift problems, the handling of radius of action, off-course correction and interception follow easily in rapid succession. From that point on, repeated use and practice will bring the results up to efficient standards.

Types of calculators and computers in use embrace an odd assortment of designs. The multitude of requirements among transport, military and private aviation bring forth calculators most advantageous for their particular purpose. Space does not permit a detailed discussion of the various types. It is necessary only to observe general features of similarity.

The majority of calculators consist of a series of discs pivoted on a common center. On one side of this assembly usually is found the speed, time, distance and fuel calculator. The most common form is that of a circular slide rule and is of such simple form as to be self-explanatory. Always remember that the 60 mark on the time scale is the speed index. In conjunction with this speed-distance side there is usually an airspeed corrective. This is important in correcting the indicated air speed to true by taking the air temperature into consideration against the "pressure altitude."

The opposite side of the calculator has varied forms for solving the wind triangle. Before discussing any operation on this side, let us put the calculator aside temporarily and consider a typical problem involving wind drift and the means of solving it mechanically.

Suppose we know the wind is 30 m.p.h. from 60° True. We want to make good a true course (track) of 315° cruising at 120 m.p.h. What heading is required and what ground speed will be made? From Figure 1 we can see that by laying out

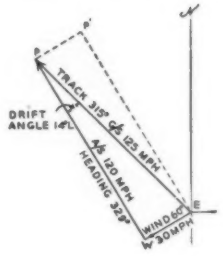


Figure 1

our track at 315° T., plotting our wind as given, we may lay off our air speed from the end of the wind arrow (W) to intersect our track at point P in the usual manner. This gives us a heading of 329° and ground speed 125 m.p.h.

It is also possible to measure our drift angle, which is found at 14°. It is to the left of our heading, so our correction must be on the right or additive so that our heading also can be determined by: 315° + 14° = 329°. It is apparent that if we were to plot this drift angle to the right we would be laying off the new heading EP' (length determined by the air speed) and forming a parallelogram (EWPP') Our wind is now P'P and our track still remains EP.

Forgetting our orginal plot of the problem, consider this new triangle (EPP') whose parts are identical in magnitude and direction to the original solution. Now suppose we decide to save a little work in the future and lay out a number of predetermined possibilities. We would have to consider variable speeds in addition to variable directions so we must decide on the minimum area a predetermined plot should cover.

Since our answer always lies at the outer end of the triangle, we need not consider all of it. The question of speed range, then, is the factor that decides this extent and must be considered from the standpoint of type of airplane. Our original problem assumed that the plane was a light standard type, so let us proceed under that assumption.

We should expect no greater winds than about 45 m.p.h. and with an average air speed of, let us say, 100 m.p.h., our resultant speed range would be from 55 to 145 m.p.h., or a total of 90 miles along the air speed line EP. We can measure out from E, then, to our mean speed (100 miles) at point 0, and describe a circle of 45 miles radius (Figure 2).

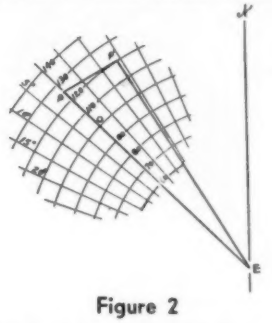


Figure 2

Along the line EP we can step off equal distances on both sides of 0 and swing air speed arcs within this predetermined area from the center E (Figure 2).

We notice now that the angle between EP' and EP was the drift angle, so it would be wise to plot a series of drift lines here at regular intervals. This leaves us with everything except "directions" and "wind."

The "directions" (track, heading and wind) are reckoned from true north, so we must move the meridian N over into the working areas. To mark off equiangular divisions from N to satisfy all possible bearings results in a simple compass rose (Figure 3).

We still have not accounted for the variable magnitudes of possible winds. The simplest way to solve it is to construct a rectangular grid with wind lines paralleling PP' and on the same scale as the speed scale. (Figure 3) The set-up would seem now to be complete except that we still have a rigid immovable diagram.

In order to make any setting for variable direction of wind and course, we must allow these two sets of lines to move independently. Therefore, the

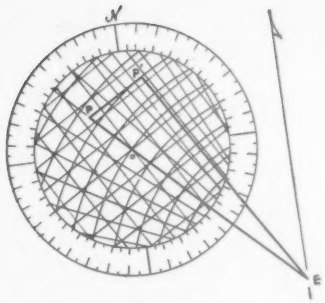


Figure 3

course and drift lines, which we can call the "drift grid," must be on a different disc than the "wind grid" and each rotating independently within the compass rose. We now have three discs: the compass rose, the wind grid and the drift grid, all pivoted at point 0. This combination is, in effect, a simple flight calculator.

Let us try our original problem again and see how it works (Figure 4). The

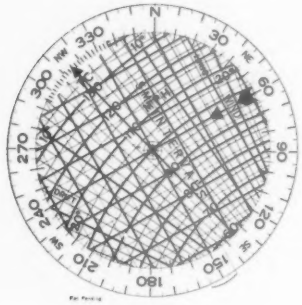


Figure 4

track to be made good was 315°, so we can set the center line of the drift grid at 315° on the compass rose. The wind was 30 m.p.h. from 60°. We move the wind grid around so the center wind line is on 60 of the compass rose. We step off 30 m.p.h. from the center (or the course line) and from that point move parallel to the course line until we meet the 120 m.p.h. arc which was the given air speed.

This point of intersection will be on the 14° drift line and, if we move down the wind grid line to the course line (track), we will read there the ground speed: 125 m.p.h. If we check this triangle, we will find it identical to the original plot.

A minor refinement for interpreting more quickly the heading from the drift angle would place a drift index of about 50°—25° on each side of course index, these degrees to be on the periphery of the drift grid circle (Figure 4). The heading then may be read directly under the drift angle on the compass rose. In the above case, for example, 14° right drift correction would fall exactly over 329° on the compass rose.

With the conception of this single problem thoroughly in mind and with a mental picture of it superimposed on the computer face, any problem involving wind effect with these same elements (i.e. heading, track, air speed, ground speed, wind direction and velocity, and drift angle) may be solved, no matter which values are unknown. The processes will follow logically, keeping in mind the original process, and rapidity and proficiency will come with repeated solutions and practice.

The limitations of every computer always should be borne in mind. The instrument just described is of most elemental design and at the same time incorporates all of the necessary elements involved in the wind drift problem. The speed and drift grid, however, are limited to speeds between 60 and 140. As speeds approach these two points the useful drift angle is also reduced. Its greatest efficiency lies somewhere between 130 and 70 m.p.h. range. There is a reasonable range of drift to expect under all normal conditions and the speed range, under the same conditions, then will be adequate for the present day lightplanes.

For planes of greater speed, two and three times the above figure, it would seem logical simply to slide out a little farther on the speed scale; that is, construct one exactly similar but instead of the 60-140 m.p.h. range, go up to 220-300 m.p.h. In effect, this is what is being done. However, in order not to limit a computer to such high speeds and at the same time to avoid enlarging the working area to an impractical size, the scale is slightly reduced and the speed range enlarged to include all possible cases. This at the same time increases the drift range.

The most important refinement, however, gives such a computer universal adaptability. The drift grid is placed under a transparent face; it is free to slide any part of its full scale under the working face. This consists of a transparent disc within a compass rose, the whole rotating as a unit within an outer frame that contains a drift and variation index at one side.

The need for a wind grid is eliminated by the nature of the working face, which permits penciled lines for the desired wind direction. There is no need then for a center pivot, but merely a dot to mark the center of the disc (Figure 5).

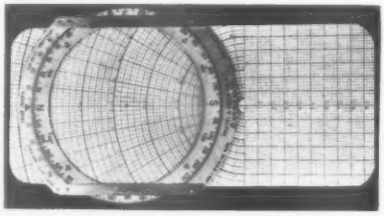


Figure 5

As described, such a computer might seem very different from the original computer form. There is no change in principle, however; only simplification gained by greater care in manufacture to maintain the required precision. The elimination of the center pivot requires a very accurately machined frame to maintain the disc center at the same point through a complete rotation. It is this feature that keeps such an instrument beyond the average pilot's pocketbook.

The instrument just described is the Dalton Models *G* and *J*, designed primarily for the Army Air Corps and used somewhat in commercial aviation. It represents the peak of this design's development. The more limited computer described first is the U. S. Coast and Geodetic type, recommended for primary training. Together they constitute one type.

Another popular basic design incorporates the principle of the full wind triangle. A sliding air speed arm, or an elongated base and grid plate, permits the setting up of the actual wind triangle (Figure 6). This has some advantage in visualizing the entire picture.

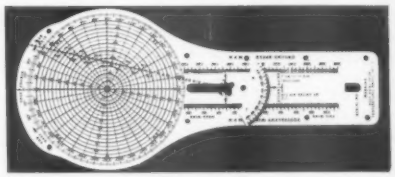


Figure 6

The instrument itself, however, consists of many more movable parts and lacks the compactness and simplicity of operation of the other design. In addition, the greater speed range cannot be accommodated without enlarging the instrument to an impractical size or reducing the scale to the point of inaccurate settings.

Some computers of this design have been manufactured to include these factors of great range and flexibility without being too large and, at the same time, maintaining accuracy. They are beautiful instruments to operate, but such fine workmanship makes them expensive and limits the production.

To understand more clearly the operation of this type of computer, let us examine one or two with the greater range problem superimposed. Extending out from under the compass rose is an elongated base plate. A long slot is found in the majority of these types along the center line of this base plate. A carrier is fitted to slide in this slot and carries an arm pivoted on the carrier. The arm is scaled for air speed, while along the slot is a ground speed scale. The compass rose is free to rotate and circumscribes a wind-scale face. This face varies slightly on some models, but ordinarily contains concentric wind circles representing various wind speeds. There are radial lines from center to compass points to assist in locating wind direction. Some models leave this face blank and provide a single wind arm pivoting on top of the compass rose face. This provides an easier and quicker setting.

Before running through a set-up, let us consider another typical problem. The wind is from the northwest at 30 m.p.h. The cruising speed is 250 m.p.h. and we want to make good a course of 270° T. The plot of this problem is shown in Figure 7, with resulting ground speed of 227 m.p.h. and heading 275°. By reversing the triangle—i.e., placing the wind at the op-

(*Continued on page 74*)

Twenty-seven pilots from Washington and Oregon—five of them girls—gathered at Seattle's Boeing Field for the race. Inset: Participants receive and discuss Roy Sugg's rules. Top: The finish at Swan Island.

SKILL DERBY

by Leverett G. Richards

Everyone won in this unique lightplane contest for Northwest flyers.

Roy C. Sugg

CONTESTS are not new or news. But when a man stages a contest just for the fun of it, a contest in which everyone wins an award of some kind, that is news.

That's what Roy C. Sugg did, with results that impressed the Pacific Northwest. Twenty-seven private pilots flew a total of 4,000 air miles in this unique meet, touching at seven widely different fields, all without getting lost or losing any paint, without a mishap of any kind. Fifteen flyers, three of whom were girls, won $250 in cash prizes.

Roy Sugg thinks the airplane is here to stay. He thinks almost anyone who can drive a car can fly a modern lightplane. Just to prove his point Roy sat down one day this summer and "dreamed up" a new kind of contest solely for those forgotten flyers, the private pilots.

Only lightplanes with top speeds not exceeding 115 m.p.h. were admitted. There was no entry fee, no red tape, no commercialism, no ballyhoo. Sugg quietly announced the contest in letters distributed at a dozen airports in western Washington and Oregon. He offered 15 cash prizes totalling $200—$50 for first, $35 for second, $25 for third, $15 for fourth, four prizes of $10 and seven of $5.

Contestants were to be judged on "ability to navigate according to the plan, on approaches, take-offs, observance of local field rules and CAA regulations," 40 points; general appearance of craft and pilot and airport deportment, 20 points; spot landings, 20 points; and elapsed time, only 20 points. It was no speed race, no stunt race, no mass flight.

Word of the contest spread by winged grapevine, unaided by organized publicity or advertising. Art Whitaker, *Cub* distributor at Swan Island, Ore., thought it such a good idea that he put up an additional four cash prizes totalling $50 for pilots of *Cubs*, plus a pilot's log book for every pilot who entered.

L. W. Hubert, Tacoma, Wash., Taylorcraft distributor, got so enthused he offered 10 gallons of gasoline to every contestant who finished but did not win a cash prize.

Despite the lack of ballyhoo, 27 pilots from the two states—five of them girls—dropped down on Boeing Field, Seattle, Wash., at all hours of the morning Sunday, June 22, for the contest's start. There was a rush for the weather office

A dead-sock landing and heavy traffic added difficulties at the Kelso stop, below. Ships participating ranged from Bird biplane (extreme right) to latest lightplanes.

to check wind, a fever of last minute calculations as each contestant completed flight plans for the five legs of the course. These figures had to be filed with the judges as the contestant's first step. Each was later judged on the accuracy with which he estimated his elapsed time between points.

Flight plans had to filed and ships on the line ready for action by 9 a.m. Pilots assembled at 9:45 (with demerits for tardiness) for instructions. At 10:15 the fi st pilot, Vernon Hubert, got the flag from the starter, waited for the green light from the control tower and took off under a high overcast into light, variable winds, while the judges graded him on his take-off procedure.

About 25 minutes after take-off each flyer landed at Mueller-Harkins airport at Tacoma after flying over an elbow of Puget Sound, biggest inland salt water harbor in the world—unless he chose to keep his wings within reach of land along the shore at a cost of two minutes additional flying time. As he approached the field one judge graded him on observance of field rules, his procedure in approach and precision in gliding for the white mark. Another measured the distance beyond the line in which he was able to make a three-point landing. Use of power or slip meant demerits. Taxiing up to the judge, he shut off his motor, or was docked if he didn't, and signed the register.

"Let's see your certificate, your engine and aircraft logs, first aid kit, fire extinguisher, airworthiness certificate and operations record," another judge asked with a smile, while still another noted unpolished shoes, unshaven whiskers and frayed edges on man and ship. (Many a crate that hadn't been waxed for a year shone like a diamond that day. The barbers and beauty parlors did a good business, too.)

By that time many a poor pilot was so flustered he completely forgot the regulation requiring a competent operator in the cockpit when he cranked his motor for the take-off. The bewildered one who unwittingly blasted the crowd with prop wash was docked for violation of field rules and improper deportment on the airport.

Ready for take-off again and a final question from another judge: "What's your course to Olympia?" Half the contestants hadn't remembered to keep a copy of their flight plans. The question had a further point illustrative of the contestant's object and value. A mile true south of the airport lies McChord Field, an Army Air Force field around which civilian flying is forbidden. Five miles southwest lies Ft. Lewis, biggest military reservation in the west and an airspace reservation. Woe to the pilot who blundered across either!

At Olympia, the state capital, the airfield was under construction. A crosswind landing on the temporary landing strip provided a practical test of flying skill. One contestant, remembering his instructor's urgent injunctions always to land into the wind, did so, landing in the rough in the path of a correctly-ap-

(*Continued on page 92*)

Nazi Radios Analyzed

Lear Avia engineers remove radio equipment from captured Messerschmitt Me-109 fighter.

GERMAN warplanes' radio equipment is obsolete and heavily dependent on *ersatz* materials, examination of a recently captured Messerschmitt Me-109 reveals. Communications units of the ship—which, shot down over England's Thames estuary, now is being displayed in this country—were given exhaustive tests by William P. Lear, American aircraft radio designer and builder, at Lear Avia's Piqua, O., laboratories.

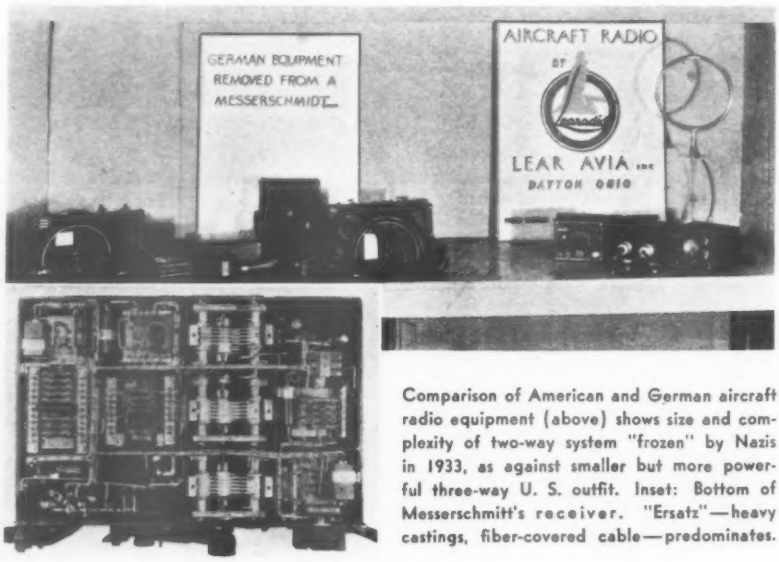
Lear's report stressed four points:

1. The Germans apparently have "frozen" their military radio design since 1933, standardizing tubes and components for ease of mass production servicing.

2. War materials shortages are indicated by use of ceramics instead of plastics, fibre instead of rubber and special alloys to replace aluminum.

3. Extremely limited transmitter range (around five miles) and provision for higher power output indicate that most planes in a given squadron can talk only to one another, while the leader alone

(*Continued on page 90*)



Comparison of American and German aircraft radio equipment (above) shows size and complexity of two-way system "frozen" by Nazis in 1933, as against smaller but more powerful three-way U. S. outfit. Inset: Bottom of Messerschmitt's receiver. "Ersatz"—heavy castings, fiber-covered cable—predominates.

Hangar Fires

TRAINED firemen and special equipment are necessary to cope with today's airport blazes, Fred H. Grieme, CAA Airport Section chief, told National Fire Protection Association members recently. He reported that this was due to changes in airplane construction materials and size and the increase in hangar size.

Huge all-metal planes can have minor fires within their cabins without endangering other ships in the same hangar, according to Grieme, but if these fires are not controlled quickly by firemen using special portable equipment, the planes' large gasoline loads will cause fires of an entirely different character. Open fires in hangars best are combated by "deluge" type sprinkler systems, which pour down thousands of gallons of water a minute. Still different equipment is necessary for paint shop and gas storage blazes.

When planes were fabric-covered, fires were more frequent and spread faster, but even today's metal airplane will burn at gasoline fire temperatures. In addition, modern planes have upholstery, electric wiring, radios and other combustible materials, as well as huge tanks of gasoline. Hand type portable equipment in addition to the sprinkler system is essential. Of all aircraft accidents, 69 per cent occur on or within five miles of airports. Today's large airplanes require large, powerful, easily-moved equipment, which should be equipped with hoists, booms, grappling hooks, tow cables, winches and a circular power-operated saw for getting into fuselages. This equipment also should have flood lights and two-way radio and loud speakers.

Citing a true case in which 20 airplanes and a new hangar were totally destroyed after a comedy of errors by an inexperienced night watchman, a suburban fire department and an over-enthusiastic but poorly trained city fire department, Grieme urged Association members to make their knowledge available to airport operators and to make specialized studies of airport hazards. Better airport personnel training, he said, is today's outstanding need.

Licenses

IN a special bulletin to FLYING AND POPULAR AVIATION, the Civil Aeronautics Administration released the following monthly statistics:

	Aug. 1 1941	Aug. 1 1940
Pilot certificates of competency	84,152	41,970
Airline transport certificates of competency	1,515	1,264
Student pilot certificates	91,294	37,652
Glider pilot certificates of competency	146	159
Student glider pilot certificates	534	392
Mechanic certificates of competency	13,041	10,267
Parachute rigger certificates of competency	484	409
Certificated aircraft	22,508	14,284
Uncertificated aircraft	438	485
Certificated gliders	52	36
Uncertificated gliders	104	98
Ground instructors certificates of competency	3,739	899
Air-traffic control-tower operators certificates of competency	388	240
Air carrier dispatchers certificates of competency	413	326

I LEARNED ABOUT FLYING FROM THAT! NO. 29

Moss learned his lesson in a Vought-Sikorsky SB2U dive bomber.

William W. Moss, Jr.

by WILLIAM W. MOSS, Jr.

Carelessness at the controls of a Navy dive bomber is something few pilots live to tell about. This writer's error may help others.

Now a pilot-navigator on Pan American Airways' Pacific routes, Mr. Moss first became interested in aviation in 1928 when he built models. In 1930 he took part in the first of many gliding activities, which later included participation in the National Soaring Meet at Elmira in 1933. After two years at Brown University, he joined the Navy as Aviation Cadet. He received his wings in 1936, went to a bombing squadron and, for the next three years, flew from the Lexington, Saratoga and Ranger. During the search for Amelia Earhart he flew seven hours a day for 10 days, off the Lexington.

DIVE-BOMBING, though hair-raising enough at first, soon became a matter of routine—a case of pushing over, lining up the target in the sight and keeping an eye on the altimeter, so that when a predetermined altitude was reached the bomb could be released and the pullout completed with the plane in level flight at an altitude of at least 1,000 feet. After the first 100 dives or so, it became pretty old stuff which I did mechanically.

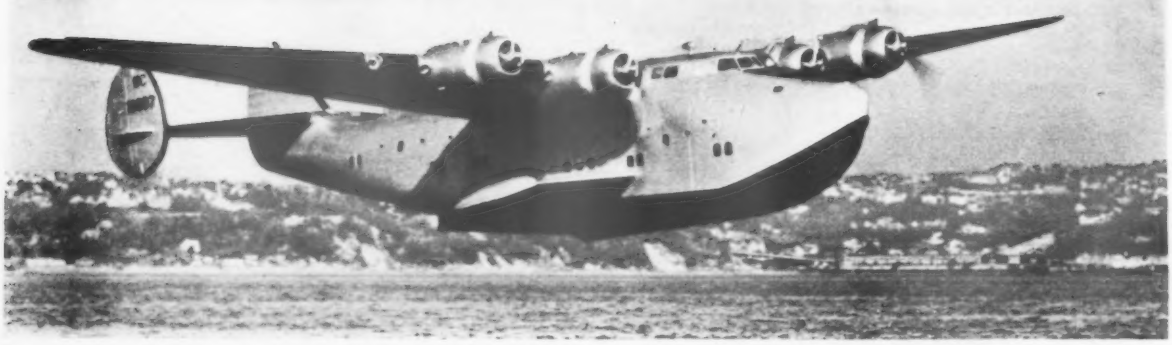
There came a day, however, when the mechanical routine was very nearly my undoing. Lulled into a false sense of security after two years of almost continuous dive-bombing, I made the almost fatal mistake of applying the same old technique to a new airplane without allowing for several factors which called for its revision.

First, I made no allowance for the different trim condition possible in a dive with the new ship, which had an elevator Flettner trim tab, as opposed to the adjustable horizontal stabilizer of the older type. With the trim tab, though I didn't realize it at the time, it was possible to make the ship nose-heavy at any speed, while the old ship retained some positive stability at terminal velocity even with the stabilizer rolled to the full "nose down" position. Second, I failed to allow for a greater altimeter lag since the new ship, being an extremely clean low wing monoplane, would dive in the neighborhood of 100 m.p.h. faster than the older

(*Continued on page 72*)

Ocean Flying Is Routine

by JUAN T. TRIPPE



Pan American's giant Clippers are responsible for an entirely new kind of airline operating technique.

Juan T. Trippe

Safest way to cross the Atlantic is by air. Pioneering, practical Pan American Airways has carried over 6,000 passengers across that ocean during the route's two-year history.

TODAY, only two years after Pan American Airways inaugurated the first scheduled transatlantic air service, more than 6,000 passengers and 750,000 pounds of mail—an estimated 32,250,000 letters—have crossed the Atlantic via the line's clippers. Miles flown during the period—from May 20, 1939, to date—total over 1,400,000. During June, 1941, alone, 717 passengers and 57,448 pounds of cargo—including mail—were carried between New York and Lisbon.

If any one man can be called "the brains" of Pan American Airways, he is Juan Trippe. He founded the company in 1927, has headed it ever since. This article was adapted from Mr. Trippe's address before the Royal Aeronautical Society in London. It is the most complete report on ocean-flying yet printed.—Editor.

Despite all difficulties, our organization has maintained a reasonable service record and an unblemished safety record. New transport techniques, largely original with Pan American Airways, are responsible. First came the multiple flight crew, whose specialized organization and training have made possible transport flights as long as 24 hours in duration. Second, accessibility of power plants, now a prerequisite for oceanic operation. Third, scientific flight control through an

FLIGHT FORECAST

PAN AMERICAN AIRWAYS SYSTEM

COMMUNICATIONS DEPARTMENT – METEOROLOGICAL SECTION

ATLANTIC DIVISION

FILED

PLACE NBA

DATE MAY 13, 1941

TO BRITAIR METEO BDA, PANOP PANMET HTA. MAP 1200 GMT

TRIP 313 NC03 TRACK BDA HTA LBN DEPARTURE TIME 2100

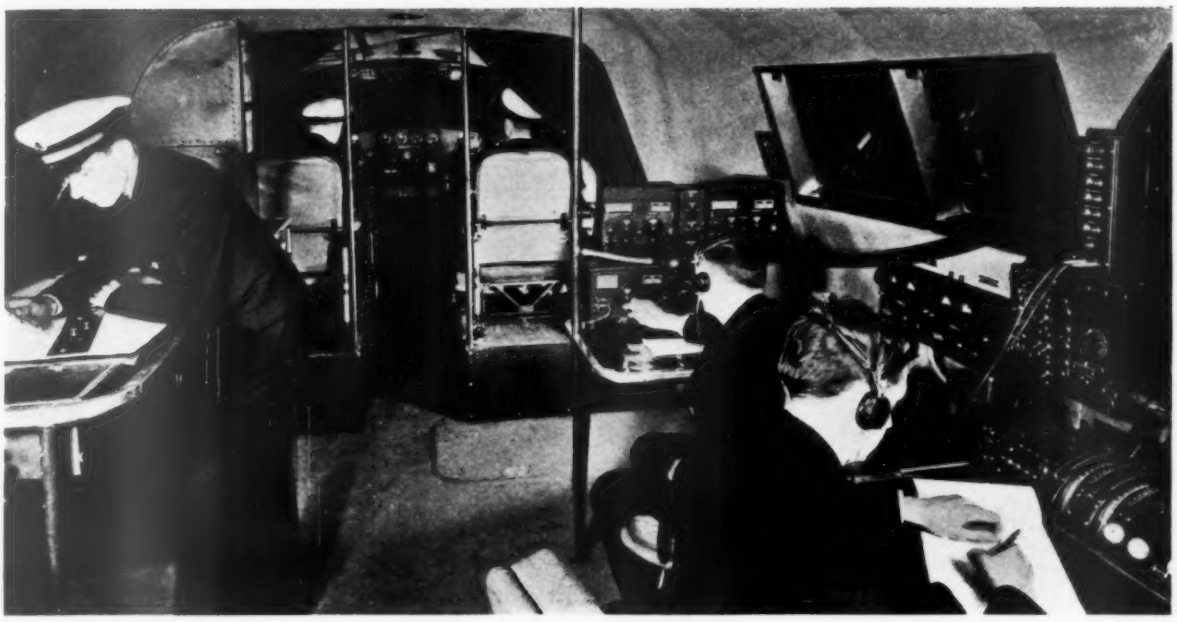
STD. FORM A1-BA

ZONE ENDING	STATE WEATHER	AMT. TYP. BASE LOWER CLOUD	TOP LOWER CLOUD	AMT. TYP. BASE UPPER CLOUD	FREEZING LEVEL	WINDS 1000 FT.	4000 FT.	8000 FT.	12000 FT.
700	SHWRS	7SC20	45	3AC100	120	S 12	SW 20	SW 18	WSW15
1300	CLDY	5CU20	40	NIL	110	SW 12	SW 18	SW 14	WSW12
1797	PTLY	4CU20	50	NIL	110	NW 12	NW 15	WNW 20	WNW 18
2200	CLDY	6CU20	60	6AS100	110	NW 15	NW 16	WNW 24	WNW 20
2500	CLDY	4SC25	45	4AC100	110	WNW 12	NW 12	NW 16	NW 16
2708	PTLY	3CU25	40	NIL	110	S 10	SSW 15	SW 16	WSW 14

TERMINALS	STATE WEATHER	AMT. TYP. BASE LOWER CLOUD	TOP LOWER CLOUD	AMT. TYP. BASE UPPER CLOUD	FREEZING LEVEL	SURFACE WIND	VISIBILITY		
HTA	CLDY	5CU22	50	NIL	110	WNW 14	9		
LBN	CLEAR	NIL	NIL	NIL	110	S 6	15		

REMARKS: TERCEIRA SAME AS HTA STOP AVEIRO SAME AS LBN STOP COLD FRONT EXTENDS SLIGHTLY SOUTH OF ROUTE AND WILL CROSS ROUTE ABOUT 700 OUT MARKED BY SHWRS AND SCATTERED THUNDERSHOWERS WITH TURBULENCE MARKED THRU FRONTAL ZONE STOP FEW TOPS TO 120 STOP SHWRS IN AND UNDR LOWER CLDS FIRST ZONE STOP SECOND FRONT OF SLIGHT INTENSITY WILL CROSS TRACK ABOUT 2200 OUT STOP WEAK OCCLUDED FRONT ABOUT 2500 OUT STOP

This is typical flight forecast which Clipper captains file before take-off.



Normal clipper crew, from left to right, are: navigator, pilot, co-pilot, radioman, flight engineer.

individual ocean flight-plan which endeavors to conduct the flight on a basis of known quantities and toward deliberate elimination of all possible uncertainties.

We consider ocean air transport's primary personnel requisites to be: (1) expert direction of the flight; (2) piloting; (3) navigation; (4) control and care of power plants; (5) maintenance of communications; (6) passenger service. Thus evolved the concept of today's standard multiple flight crew, composed of a captain and his crew of 10. Directly responsible to the captain are five officers qualified as specialists in the primary departments: piloting, navigation, engineering, communications and passenger service. Each has a qualified assistant to relieve him for rest periods. This composite group's training ensures its smooth and automatic functioning at all times as a complete flight operational organization.

The clipper captain, its chief administrative officer, is invariably a veteran of many years' experience. Through research and study he has attained the rank of Master of Ocean Flying Boats. He holds the equivalent of a master mariner's ticket. In our experience, it takes five years' training and post-graduate study to make a master ocean-flight captain out of an excellent pilot.

Sustained engine power is a flight necessity. For years we knew that accessibility of power plants in flight would be of inestimable value. Until development of our latest type clippers, however, this was impossible. In the Boeing B-314 a companionway on each side of the flight deck leads through the wing to separate stations in the nacelles of each of the four engines. Although the entire engine is not yet accessible, these stations do provide quick access to each motor's accessory end. The flight engineer may make periodic visible inspection of the engines' mechanical functioning and their delicate electrical, fuel and oil systems. He also has available for inspection all main fuel lines, all control lines and all interior elements of the wing.

I have no way of quantitatively measuring this accessibility's value. But during the past two years, in which this type of clipper has been in operation on both the Atlantic and Pacific, we have had 431 cases of repairs made in flight. The affected power plants were kept going or else quickly returned to operation. In 64 instances, had the engines not been accessible, the ship would have been forced to return to its nearest base with only three of its engines operating.

For safety, each transocean Boeing B-314, when used on flights of 2,000 miles or more, must carry sufficient fuel, based on the foreseen conditions, to arrive at its destination with a fuel reserve ade-

PAN AMERICAN AIRWAYS COMPANY
ATLANTIC DIVISION
OPERATIONS

WATCH HOUR SCHEDULE

G.C.T.	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Captain	A			A	A	A		A	A		A	A				A	A	A	A			A	A		
First Officer	B	A	A			B	A		B	A			A	A	A	B				A	A			A
Second Officer	N	N	N	N	N				N	N	N	N	N	B				N	N	N	N	N		
Third Officer					B	N	N	N		B	B			N	N	N	N				B	B	N	N
Fourth Officer		B	B	B			B	B				B	B		B		B	B	B	B			B	B
Engineer Officer	C	C			C	C			C	C			C	C	C	C					C	C		
Asst. Eng. Officer			C	C			C	C			C	C					C	C	C	C			C	C
Radio Officer	D	D			D	D			D	D			D	D	D	D					D	D		
Asst. Radio Officer			D	D			D	D			D	D					D	D	D	D			D	D

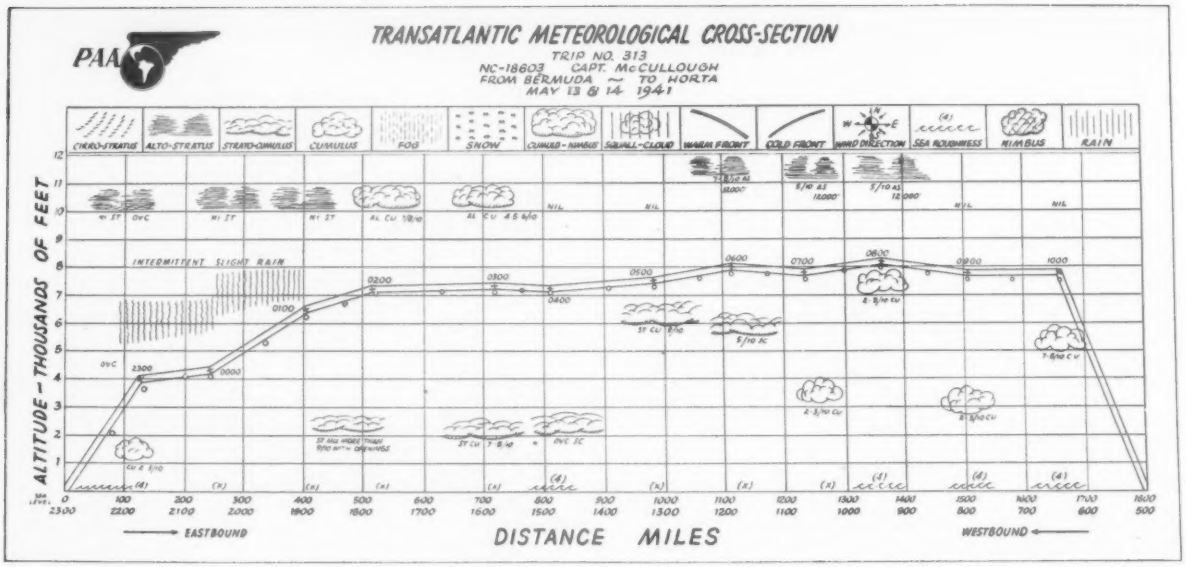
1st. Steward
2nd. Steward - Intermittent Continuous Duty

TRIP NO. 313

DATE May 13-14, 1941

A - In Charge of Watch
B - First Officer
C - Engineer Officer
D - Radio Officer
N - Navigation

Before each transatlantic flight, crew members are scheduled on this operations chart.



Supplementing basic weather and upper air maps is this forecast chart, primarily for the captain.

quate for an additional 4½ hours of flying. The most critical ocean flight factor is fuel consumption. Efficient fuel utilization determines flight efficiency.

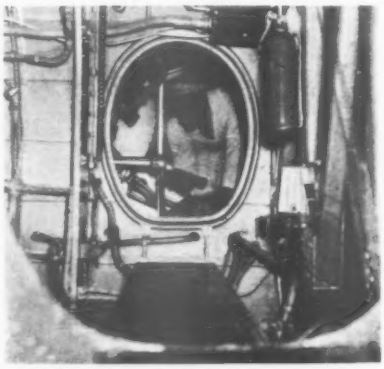
"Scientific control of flight" is the general term describing the process by which the aircraft's most efficient performance is charted through the most favorable conditions available to that flight. How we undertake to make this process scientifically accurate may best be explained by describing an actual average transatlantic crossing, the critical Bermuda-Horta long range sector of the eastbound *Yankee Clipper* flight of May 13-14, 1941.

In the two days before its departure, 185 mechanics—including 19 inspectors—operating through three eight-hour shifts, worked on and checked 1,500 separate items required by our maintenance routine. Originally this process consumed six days. Its reduction to two days is an important aircraft utilization efficiency factor. A test flight precedes each crossing. It is conducted by the crew for the approaching transatlantic trip, accompanied by maintenance and service engineers, inspectors and mechanical specialists. Airspeed and all fuel-flow indicators are calibrated and all compasses carefully compensated.

After the aircraft, as finally tested, is accepted by the captain, the flight plan is formulated. First step is the final weather map, representing the most modern air-mass methods of weather analyses application to transatlantic flight problems. Supplementing this general chart are upper-air weather maps on conditions at 5,000 and 10,000 feet. A third chart—a new departure—is a third-dimensional or vertical weather chart, which provides the pilot with an illustration of what conditions to expect.

From these charts, the meteorologist divides the projected flight line into various zones. Each zone represents an area of more or less consistent winds. Lengths are dependent on the various pressure areas' and weather fronts' location. These zone boundaries indicate the points at which a new track or flight level should be selected. From this map and the supplementary charts are prepared a flight forecast indicating the weather: amount, type and height of clouds; estimated level of freezing temperatures; and wind direction and velocity at 1,000, 4,000, 8,000 and 12,000 feet.

From this flight forecast, captain and airport manager evolve the flight time analysis which correlates the complete range of the aircraft's mechanical ability with the conditions to be encountered or to be detoured either laterally or vertically in each zone. The analysis is calculated for each of the four primary altitudes and ground speeds figured so



Each of clipper's four engines is accessible for inspection by flight engineer.

that time required to pass through each zone and to complete the entire flight can be estimated.

These computations yield a three-dimensional path of best conditions for the flight. They determine the safest, most efficient speed, track and altitude for each sector.

This flight time analysis also includes a separate fuel consumption estimate for possible three-engined operation. This data determines our so-called "point of no return," a designation of that limit-point before which any engine failure requires an immediate return to the departure point and beyond which such return is no longer practical.

Upon the flight time analysis' acceptance by captain and airport manager, the first officer figures what payload can be carried and computes the weight-and-balance manifest, determining location for all passengers and cargo to obtain the most favorable center of gravity for the take-off, flight and landing. The third officer assembles the various clearance manifests required by the governments along the route. The flight engineer proceeds with the plane's fueling and servicing in accord with the analysis' figures. The B-314's have total tank capacity for 5,400 gallons of fuel. Operating gross weight on all long range flights is invariably 84,000 pounds.

On the take-off the captain controls the throttles and control surfaces and the first officer mans the flaps and short-range radio telephone to the stand-by launch, while the flight engineer constantly checks cylinder head temperatures and oil and fuel pressures. Take-off power is 1,550 h.p. per engine at 2,400 r.p.m. Take-off manifold pressure is 42½ inches. Under normal conditions take-off requires approximately 30 seconds from the time full power is applied until the aircraft leaves the water, after a run of approximately one-half mile. After take-off the aircraft is held immediately above the water until an airspeed of 105 knots is reached. At this point full maneuverability on three engines is assured. The engines then are pulled back to 1,200 h.p. each. This output is maintained until all obstacles are cleared, generally at a height of 500 to 1,000 feet. Again the engines are throttled back to their climbing horsepower (900 h.p.) and 110 knots speed maintained until the selected cruising altitude is reached.

(*Continued on page* 58)

LADY ACE

by HILL EDWARDS

An able flyer, Grace Huntington holds instructor's and instrument ratings.

Although she's set new altitude records, Grace Huntington is most interested in getting aviation to give women flyers a share of the jobs.

WHEN Larry Therkelsen, contest representative for the National Aeronautic Association, told pretty Grace Huntington, 27-year-old flying instructor, that she had established a new altitude record by going to 24,311 feet in a 65 h.p. lightplane, she showed only moderate enthusiasm.

In fact, she stated quite frankly that she hadn't accomplished much and that there really wasn't anything to get excited about. "It's true," she declares, "that I did go that high, establishing a new record in the 244-397 cubic inch displacement classification. But a lot of people have been far higher. I'm going to go a lot higher, believe me, before I get through.

"I just scraped the bottom of the top. There's a lot to learn about the upper air, a lot of valuable information to be had. I hope I play a part in getting it."

Daytimes, Grace (with approximately 700 hours, a commercial license, a re-rated instructor's rating and an instrument rating) wrestles a lightplane around Union Air Terminal at Burbank, Cal., for Paul Mantz. Nights, she dreams of new worlds for women to conquer.

Days, she builds up a certain amount of satisfaction with the thought that 20 or more men have enough faith in a woman's ability at the controls, coupled with a woman's definite coolness of head, to allow her to teach them to fly. In off hours, she's definitely impatient because it's a man's game, this flying, and a woman comes off second when after really important jobs.

"At present," she says, "I'm planning to do research work under the direction of Dr. Dwight Pierce in insect life at high altitudes. This, I hope, will open up a whole new field of study, explaining insect migrations, showing what varieties fly at high altitudes, speed of travel and many other factors which might be of general benefit. Such work, in connection with altitude records or not, might be really significant."

Grace, at the moment, is a bit bewildered by the attitude of men towards her flying. In four and a half years of safe and sane flying she's had two ferry jobs, which paid her expenses. Her present job is the first which has had any remote connection with a pay envelope. This in the face of the fact that they aren't giving re-rated instructor tickets in exchange for six soft drink bottle tops this year, and instrument ratings aren't found in Christmas stockings.

"Apparently no one, with the exception of Paul Mantz," she says, "wants to give a woman a job. If you'll make a quick check you'll find that in most cases where women are instructing they own a share of the business. I say in *most* cases."

Grace, serious student of everything she has undertaken, has even had to pick up her technical information piecemeal.

"During my training period," she says, "I've tried to enter four schools and have been turned down. At the first, when I applied for a course, I was not even permitted to plead my case before the registrar. At the second, where I went to learn about engineering and motors, I was also turned away. A third school wasn't interested in having me for a student and, at a technical college, I was turned down when I sought to make a study of upper air conditions."

Only at one school, California Flyers, was she acceptable as a student.

Her attempts at altitude shattering, rewarded now by two records, have been "catch as catch can" affairs. Meaning by that, she's managed to catch an airplane here and there, get up for two or three hours and then return the airplane.

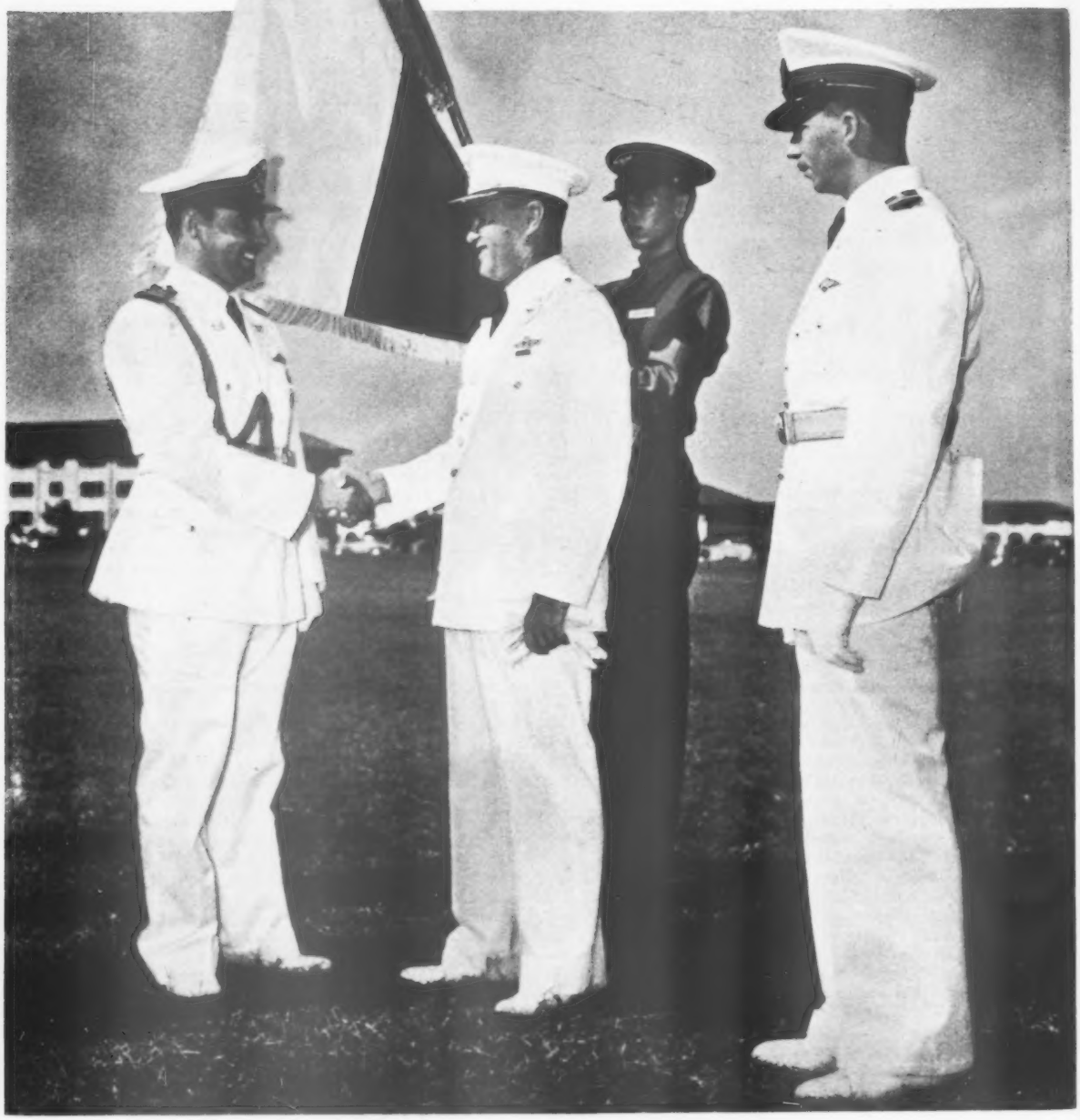
Her first experiments were strictly unofficial and she shared the cockpit of the *Cub* trainers she used with Evelyn Hudson, another California girl who has made good. Miss Hudson now operates a school under the CAA, training students from Pasadena Junior College. In airplanes loaned by Joe Plosser, a Glendale operator, Grace and Evelyn played around at about 15,000 feet during the early part of 1939.

Then Grace, setting out on her own,

(*Continued on page* 66)

A HEMISPHERE DEFENSE PLAN

by DAEDULUS



Two high-ranking Chilean air officers are welcomed to Randolph Field by Col. Idwal H. Edwards (center).

The plan advocated in this article is being followed to a minor degree at Randolph Field, where these Venezuelan flyers are taking "refresher" course.

U. S. military airmen should exchange visits and information with groups like this from the Brazilian Air Force.

The Author suggests that Uncle Sam demonstrate his good neighborliness by working closely with Latin and South American army and navy air forces.

BEHIND the present urgent, but somewhat confused, efforts to bind the American nations together to face a common peril, a definite proposal to make hemisphere defense a realistic, mutual affair is beginning to take shape.

That proposal is that the United States Army Air Forces exchange as many as 100 pilots annually with each of the leading Latin American countries—not student flyers, but tactically trained officers of the experience and caliber of potential squadron commanders, at least.

The thought is that the United States flyers should become integral members of the Latin American air forces for a year or more, flying with air tactical units and becoming intimately acquainted with their problems.

Already a step has been taken in this direction—but only a step. The War Department arranged to permit 16 pilots from eight Latin American republics to start refresher training at Randolph Field, Tex., on August 23, followed by two and a half months' actual service with tactical units. Another such group is to follow the same course in February.

But this one-way scheme of limited scope omits the mutual feature that would give it real importance to the defense of the Americas. There is no provision for United States military airmen to serve in the lands which comprise the danger area.

A genuine comradeship in arms, such as now is proposed, is needed to dispel lingering doubts as to the readiness and will of the American republics to defend themselves against any alien threat, whether a future transatlantic aerial invasion or a fifth column-instigated *putsch*. The project has not reached the stage of full official consideration, but it can be said that it has influential military support. The lesson from the tragic failure of Belgium, the Netherlands and Norway, to cooperate in advance with forces eager to help defend them against a Nazi invasion, has been learned.

The advantages promised the United States are clear. The compensations to friendly neighbor nations are more than ample to quiet any remaining Latin American suspicions of the Colossus of the North. A year's actual service with the air forces of Argentina or Brazil, for instance, would enable a group of capable United States Army airmen to become virtually as familiar with the terrain, flying conditions and defense problems of these countries as their own military men.

For full effectiveness, provision should be made for exchange photographing and mapping. The further suggestion is advanced that control boards be set up in each of the cooperating countries to administer both the exchange arrangement and general problems of mutual air defense. The information collected and assimilated would be immediately available for the new air staff of the Army Air Forces and the general staffs of the Latin American forces.

With so much at stake in the way of good will, pilots figuring in the exchange obviously should be hand-picked, preferably being volunteers with a working knowledge of Spanish or Portuguese. U.S. Army Air Forces' officers have been requested by the War Department to study Spanish. Special courses have been arranged for teaching the language.

To Latin American pilots admitted to the United States Army Air Forces, a primary advantage is that they would share almost from the beginning in the creation of an air power which promises to become the world's greatest.

Familiar with North American industrial methods and aircraft, as well as advanced military organization and tactics, they would be the natural leaders in the inevitable commercial and military air development of Latin America after the passing of the present emergency. Argentine, Brazilian or Chilean flyers with the experience of a year or more service in the United States Army Air Forces could expect to command in their homelands some of the same prestige that was enjoyed at the turn of the century by American physicians who had studied in Vienna and Paris.

Other considerations stem from the proposal. For the time being, United States and British requirements are so urgent that there are virtually no new planes to be spared for friendly neighbor nations. But a year hence the picture promises to be altered materially. It is only logical to assume that, when the matter of priorities for Latin America becomes a live issue, those countries which have cooperated most willingly with the United States in a time of crisis may expect the greatest consideration.

From the standpoint of Washington diplomacy, the presence of substantial groups of airmen with a background of United States Army experience and sympathy would provide a safeguard against any future European fifth column activity such as that which led to the recent forcible action by the Government of Bolivia. No proposal yet put forward promises as great a measure of immunization against Nazi infiltration.

Granting free access to United States Army methods and training to groups of airmen of friendly countries would provide, incidentally, a convincing answer to the mutterings of criticism south of the Rio Grande that Uncle Sam is inclined to talk more than act in the interests of hemisphere solidarity.

The objection is anticipated that to permit United States Army pilots to serve with South American air forces would be a surrender to Yankee infiltration. But it would be open and amicable infiltration, with ample compensatory advantages, in contrast with infiltration by the Nazi or Fascist model with which South America has had wide experience. The objection could hardly be raised logically by Bolivia, whose army is largely German-trained; or by Peru, where the influence of the Italian air force was strong on the eve of the European explosion. From the viewpoint of cold military realism, furthermore, the fate of the South American nations is inevitably bound up with that of the United States.

Unable for the moment to meet Latin American demands for aircraft, preoccupied with immediate national defense problems and hampered by restrictive legislation and other factors, the United States has made relatively slow progress thus far toward knitting hemisphere aerial defense together on a cooperative basis. But there was the air tour of Army posts last fall by Latin American chiefs of staff, at the invitation of Gen. George C. Marshall. Latin American admirals subsequently viewed Navy installations and, this spring, there was a brief air tour by attaches.

In 10 Central and South American countries the War Department has military and air missions, aside from the regular attaches. The largest is in Brazil, where 10 officers are helping train the Brazilian army and air force. In Argentina are four Air Force officers; three each in Chile and Colombia, engaged in instructing the military flyers of these countries.

Pan American Airways and its affiliates have progressed gratifyingly in extend-

(*Continued on page 92*)

by HURD BARRETT

ONE of the larger airplane factories in California—Lockheed—is hiring men of extremely short stature, some of them midgets, to do rivet-bucking in close places on plane interiors. This is one of those things a man looking for a job wouldn't foresee in a thousand years. When we heard about it the other day we remembered that, when we worked as a fuselage assembly mechanic about six years ago, there was one man in our department who was 4 feet 11 and who could get his hand through a 2½-inch lightening hole. He spent all of his time crawling in and out of small openings, bucking rivets in inaccessible places—and, in spite of the fact that he wasn't much of a mechanic, the foreman hung onto him through lay-off after lay-off.

We cite this as an example of the hidden qualifications for a specific job that a man may have without knowing it. And if any of you happen to be small of stature—you *don't* have to be a midget—it might not hurt to bring this to the notice of whoever is interviewing you for an assembly mechanic's or riveter's job. Point out to him the fact that you could work inside of a nacelle, tail section, wing, or other cramped assembly very much more effectively than a large man could. Chances are that he's never thought of that angle before and that if you are qualified you'll get the job.

* * *

S. M. H., Little Rock, Ark. You ask about the qualifications for Wright Field model makers. We'd like to point out, first, that these models are not at all like the scale models or gas models that the fellows in the sandlots fly, although experience in that type of model-making wouldn't hurt you a bit in the other work. The wind tunnel models Wright Field tests require an almost uncanny woodworking skill. Measurements and contours are down to the half-a-ten-thousandths of an inch and even finer. The skill and patience of a model-maker usually is acquired only over a long period of years. Most of the ones we've met are men over 50 and were model-makers in other industries.

These wind tunnel models are made not only by the Army, but also by virtually every major manufacturer. Top-rank model-makers are in demand everywhere. This is because they can do many other types of skilled work. Wages run as high as $2.50 an hour. Some of the qualifications beside wood-working skill include a knowledge of lofting, lay-out, drafting and higher mathematics.

If you think you can fill the bill for this work, address any major manufacturer's personnel department; or if you'd like to try the Army, direct your letter to the Personnel Officer, Wright Field, Dayton, O. As an Army civilian employee, you'd undoubtedly be subject to Civil Service examination before appointment. In any event, he can tell you how to go about it.

Your letter, incidentally, was very complete and well composed. We think your qualifications would fit you for several pretty good jobs in manufacturing. You might try to get on as a junior draftsman or as a template maker. Or, if you want an office job, your mathematics might land you something in estimating, scheduling, calculating (that's a branch of the engineering department that does special mathematical work), or material control.

* * *

Incidentally—speaking of Army or Navy civilian employees—did you know that a list of U.S. Civil Service jobs is hanging on the wall of your post office? The list gives the name of the job, some of the qualifications required to fill it and the place and date on which examinations for appointment will be held. Jobs range from steam-fitters to carpenters and clerks, with any number of gradations in between. Uncle Sam is U.S. employer No. 1 and many of his jobs are not yet filled.

* * *

Quite a few of you who have written in are older men with no specific experience or skill in aviation, but with professional or business experience of some responsibility and importance. Up until this year, the chances for such men have been meager, since the industry was highly specialized. Now in the throes of expansion, however, there are opportunities for men who have "savvy" in any number of aircraft lines. Newspapermen find work in public relations, lawyers and accountants hitch up in accounting and in various executive positions. Other men of judgment and experience in handling people are hired for personnel administration. Doctors are hired as salaried medical examiners. Nurses do welfare work. . . .

Getting this kind of a job—or telling someone else how to get one—is pretty difficult. There naturally are fewer jobs among managerial staffs than there are in the mechanical or technical divisions. But on the other hand, persons of the caliber to fill executive jobs are relatively rare. In most large cities there are "business services" which specialize in finding managerial help. They are often patronized by firms who are looking for men to fill top jobs. Sometimes, they even have hot-shot salesmen who make it their business to keep track of

(*Continued on page 76*)

LANDING SPEEDS IN DESIGN

by PEYTON AUTRY

Reduction of parasitic drag in today's airplane is permitting engineers to concentrate their studies upon the controlling principles of wing efficiency.

GREAT strides have been and are being made by aerodynamicists to increase the efficiency of the airplane. At the present stage reached in the aerodynamic design of aircraft any appreciable increase in lift or decrease in drag results in very noticeable increases in performance. The slot and flap, as we know them in their present roles, have been great factors in the progress made in performance and have indirectly affected other characteristics.

The parasitic drag of the present airplane is being reduced to a minimum and attention thus being turned toward new developments in the basic principles of the wing itself. Successful attempts are being made to increase the lift of the present wing with the same or less drag as that at present values of lift. It is widely known among designers and those engaged in research work that the wing in its present form is not the ultimate to be desired in efficiency.

Higher values of the airfoil maximum lift coefficient are to be desired, principally because conventional landing speeds can be retained with a reduction in wing area and a corresponding reduction in wing drag. This, of course, obviously results in a higher performance, especially in top and cruising speeds. This is best done if there is no increase in the minimum drag coefficient. All retractable wing lift devices have this advantage since they can be extended a given amount upon landing or climbing. When they are retracted, the original minimum drag coefficient is retained, such as would be desired at top speed.

In Fig. 1 is a detailed set of curves for the stalling or landing speed plotted against values of the wing loading from six pounds per square foot to 25 pounds per square foot. Various curves for values of the maximum lift coefficient are plotted thereon. Some of the upper curves will give an idea of the landing speed of airplanes with thin wing sections and no flaps or slots. In this class are some of the racing jobs which also have relatively high wing loadings. As an example, a racing airplane weighing 2,500 pounds and having a wing area of 100 square feet would have a landing speed of almost 100 m.p.h. if using a wing with a maximum lift coefficient of only 1.00 (which would be a *thin* wing). This is shown by the uppermost curve in Fig. 1.

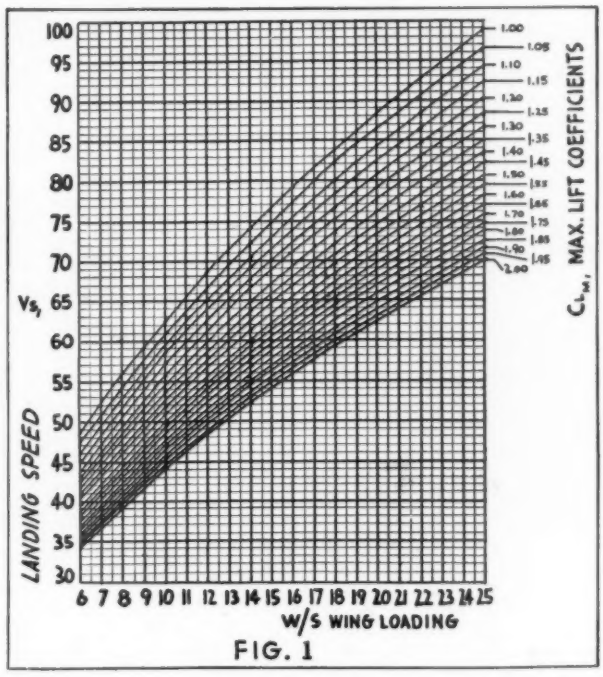


FIG. 1

Also, a lightplane weighing 600 pounds with the same wing area, but having a wing section and flap combination capable of giving a maximum lift coefficient of 2.00, would have a landing speed of only 34 m.p.h. The curves in Fig. 1 can be used to advantage in preliminary design or in setting up a series of trial designs for various values of gross weight, wing area, airfoils, flap and slot combinations and landing speeds. An average set of values of the speed range or ratio of top to stalling speeds may be incorporated to include the top speed. The top speed is the product of the speed range and the landing speed. The speed range will depend largely on the parasitic cleanliness and the presence of flaps or slots. Choosing a value from a design in similar physical characteristics would be suitable for preliminary estimation. Also, if the same value is employed for any kindred design series, the *changes* in the top speed will be evident, which would be the real purpose of including it in the series. Those factors, however, which are dependent on Fig. 1 in their entirety are much more accurate. The accuracy of top speed is dependent on the accurate estimation of the speed range.

In Fig. 2* are some various combinations of fixed slots and flaps of a "Clark Y" wing, showing the variation of lift and drag for each. These are about the type of increases to be expected from the average airfoil with these types of flaps and slots. It previously was pointed out that any such device which encloses itself or retracts to form the original airfoil will have the original minimum drag coefficient. This is borne out by comparing the basic "Clark Y" in Fig. 2A with airfoil E. A maximum lift coefficient of 1.950 is present in E with flap deflected 45°, as compared with 1.291 for the original airfoil. Of course when the perfectly flaired flap in E is raised it becomes the airfoil A with the same minimum drag coefficient. This point also is borne out in airfoils D and G.

It will be noted that the flap in F gives a slightly higher value of the maximum lift coefficient, but also a slightly higher value of the minimum drag coefficient. This increase in drag in F (which is not present in E) is due to the opening which is present at the leading edge of the flap.

The ideal slot is one that increases the lift to a worthwhile degree, yet with little or no increase in drag. The nearest approach to this in Fig. 2 is airfoil C. However, this slot could not be termed ideal in any way because the increase in drag is too numerically evident.

A similar slot recently has been developed wherein the drag increase has been reduced to almost nothing with the innovation of the slot on the wing. This is an equal pressure slot and is very much like that in Fig. 2C. At low angles the upper and lower openings of the slot are at locations of equal pressure on the airfoil. Hence the flow of air does not enter the slot from which there is no resulting drag.

(*Continued on page* 105)

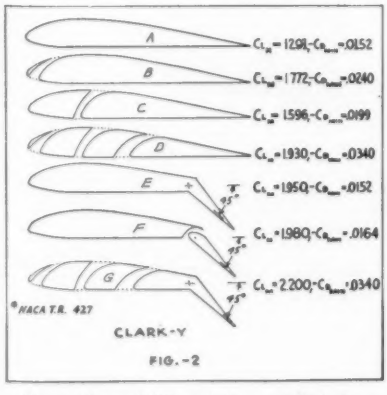
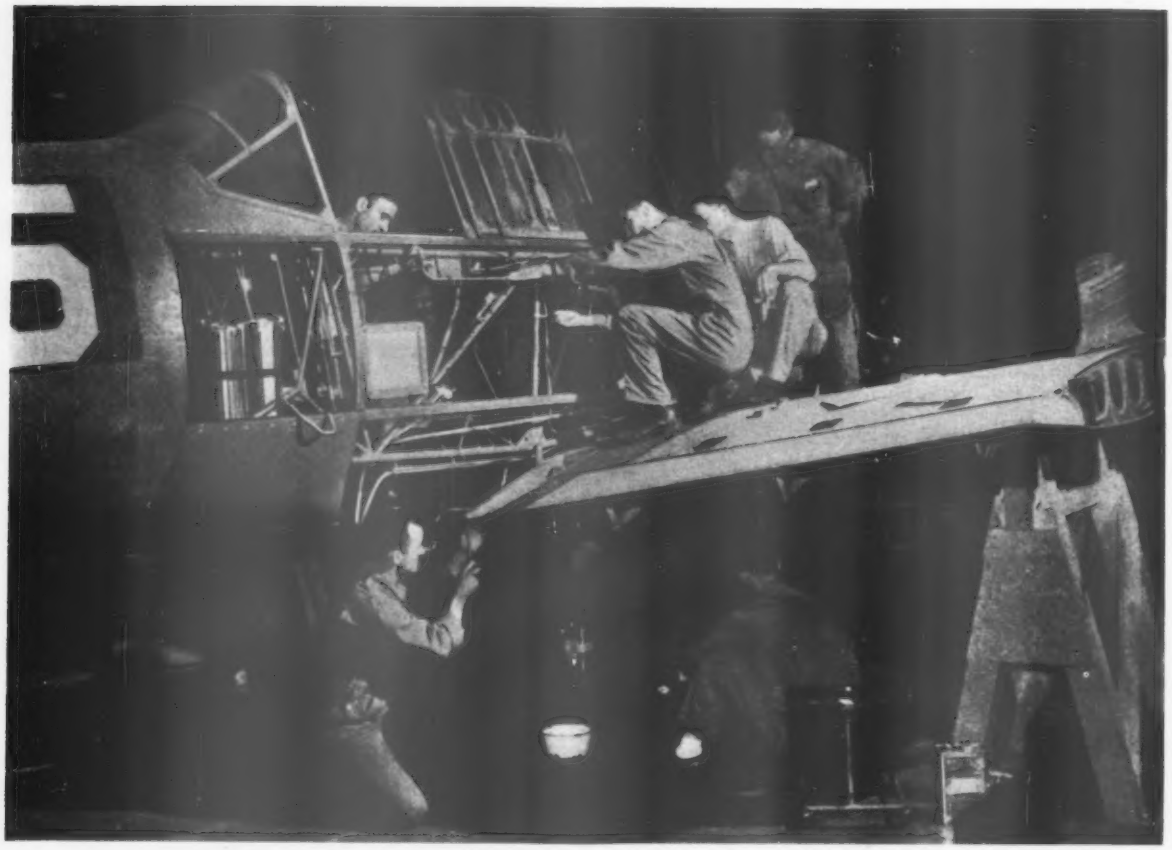


FIG.-2

Comparison of lift and drag coefficients are shown for various wing cross-sections.

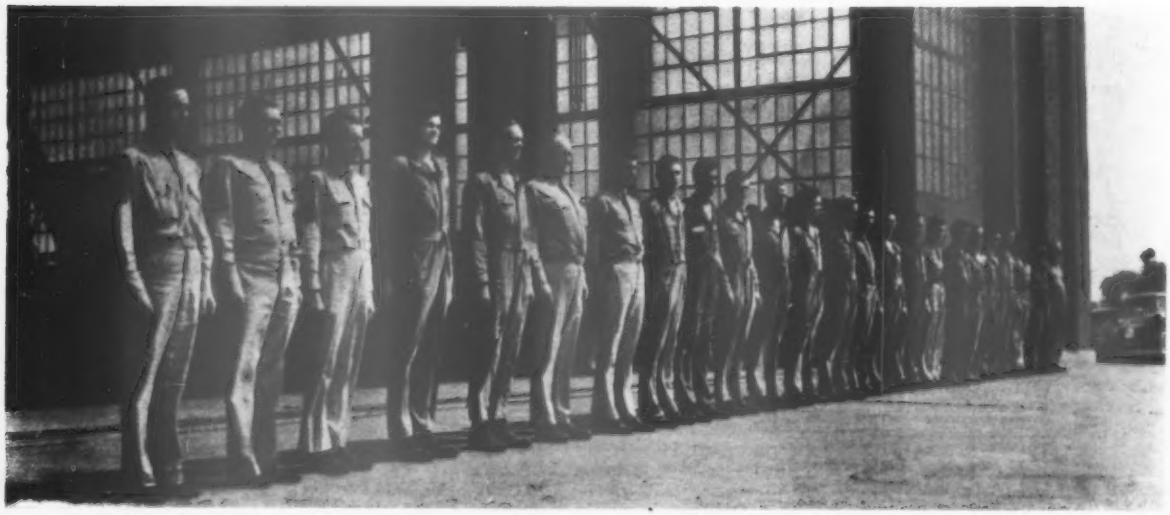


Army recruits, under direction of civilian instructor (top right), work on a basic trainer.

MOBILE MECHANICS

by DOUGLAS J. INGELLS

Part of Fourth Repair Squadron, mobile unit at Patterson Field (480 men), hold daily inspection.



Trainee (right) sees expert sheet metal workers replace skin on stabilizer of Army Curtiss A-18.

Enlisted men, earning $21 a month learn skilled defense jobs from civilian experts at Fairfield Air Depot. They form mobile repair crews for the Army's new air bases. Cargo planes carry men and supplies.

CIVILIANS, for the first time since World War I, are training enlisted men at Patterson Field, near Dayton, O. They will be skilled workers to form mobile depot units that can be sent anywhere to keep U. S. fighting planes ready for action.

Recruits are being trained as typists, welders, sheet metal workers, propeller experts, machinists, pattern makers, master mechanics, photographers, electrical workers and radio mechanics. They are learning craftsmanship at Uncle Sam's expense.

Only recently authorized by the War Department, the mobile units are the latest additions to the Air Corps maintenance operations. The units, as training is completed, become the responsibility of the Maintenance Command under Brig. Gen. Henry J. F. Miller at Wright Field, also near Dayton. They are the outgrowth of the demand for more repair and maintenance crews at new Army air bases. Patterson Field officers cannot reveal where these units may be sent; great secrecy surrounds all troop movements. But it is believed that some will go to Greenland, Newfoundland, Nova Scotia and Alaska. (Less than a month ago several hundred trainees departed for the Army's Trinidad base.)

Each mobile unit comprises approximately 500 men. At present the men are being trained in the Patterson Field shops, but training is to be extended to include other Air Corps depots in San Antonio, Tex., Sacramento, Cal., and Mobile, Ala., as demand is increased.

Recruiting offices already have been set up at Patterson Field to enlist men for the training. Men sign up for three years and will learn trades they might never have had access to in civilian life.

"We get an average of 15 recruits per week," an Army officer explained, "classifying them for their special capabilities and training them to be experts in their respective trades so vital to our defense.

"Unlike the last war," he added, "when cooks were made to do machinists' jobs and mechanics were put in the kitchen, we are trying our best to place young men in jobs for which they are best suited. We get specialists, worth many times the Army pay, who are doing their Army jobs without a kick. Many say they are looking to big jobs in aviation when the war is over."

The mobile units are designed to be in readiness for any Air Force job that might arise anywhere. "Get there quickly with needed labor and materials necessary to keep the planes in perfect condition at all times," is the watchword.

Suppose a Selfridge Field pursuit pilot has engine trouble and makes a forced landing somewhere in Indiana. He contacts the nearest air supply depot and asks for a repair crew. Members of the mobile unit, dispatched by plane with a new engine for the pursuit ship, speed to

Clerical work is part of mobile depot's task. Girls teach soldiers office duties.

the scene. They either repair the damaged engine or install the new one.

Army transport trucks are assigned to the mobile units for the movement of personnel. The Trinidad group went by motor truck across nearly one-fourth of the U. S., continuing by troop ship from a southern port. Each unit also has a squadron of cargo planes.

The mobile unit is divided into three squadrons: supply, headquarters and repair. Supply squadrons furnish parts and equipment to Air Force units. Headquarters squadrons perform administrative duties. The repair squadron maintains and repairs airplanes.

For these jobs Patterson Field is training specialists. Enlisted men—who never before had an opportunity to do clerical, administrative and shop work—now are being given the chance. Necessary to any business is an efficient administrative staff. Since the mobile units are regular depot organizations in miniature, streamlined for fast traveling to any point, they comprise their own business staffs.

Supplies for delivery must have proper authorization, whether "rush requests" or otherwise. Letters must be written, telegrams sent, freight bills okayed, filed and receipted, accounts kept up to date and contracts signed. This requires a staff of accountants, secretaries, clerks and assistants. Expert accountants, shorthand professors, secretaries, have been hired by the Army to teach soldiers these jobs. Recruits learn typing, how to operate business machines, and other phases of clerical work.

"Soldiering isn't bad when you get into something you like," a young recruit accountant remarked. "Ever since graduating from high school I've wanted to advance my mathematical education but never had the chance. Now I'm learning from practical experience and getting paid at the same time."

This isn't propaganda. Young men at Patterson Field actually are getting into the trades they desire. Here the Army has relaxed regular pay standards for its specialist trainees. As recruits produce better and more work, they get pay increases regularly. Some with ranks of private are getting as high as $45 per month. Too, recruits get clothes, food and lodging free and Saturday nights off.

At Patterson Field the Army has its own photographic school, where darkroom instructors and expert cameramen teach photography. All types of cameras are used. The recruit is taught the importance of color, light and exposure. Though not as large as the extensive school at Lowry Field, Denver, Colo., the school here rapidly is turning out qualified photographers.

Maintenance of modern airplanes requires expert sheet metal workers. Modern bombers have metal framework and skin. When they need repairs it takes trained riveters to handle the thin material. In special shops at Patterson Field young recruits learn to rivet. There are stockrooms where the smooth surfaced dural sheets are stored. Each sheet must be cut to proper shapes, pressed to fit certain contours. The mobile depot men learn to operate powerful hydraulic presses that do the trick.

Metal workers hired from key aircraft factories and some who have been loaned to the Government for this specialized training are instructors in the shops. Machines that duplicate those in use at aircraft factories have been purchased.

(Continued on page 100)

In pattern shops, enlisted men (below) carve wing rib forms. Lathe worker makes tent poles.

Recruits show most interest in photographic studies offered at Patterson. A civilian (below, holding print) demonstrates darkroom technique to enlistee.

Aerodynamics Condensed

by RAOUL J. HOFFMAN

AERODYNAMICS deals with the subject of forces created by bodies moved through the air. Its actions are predictable and therefore flying characteristics of an airplane can be determined with great accuracy. But some new function may be discovered that will create new airplane designs not possible with today's accepted standards.

A flat plate, held inclined to the oncoming air stream, will deflect the air and exert a pressure closely vertical to the plate as indicated by R in the upper sketch in Section 1. The inclination of the plate to the air stream is the angle of attack. The plate's equilibrium, or where the resultant R intersects, is the center of pressure. The ratio of the span and average chord is the aspect ratio.

On flat plates, the center of pressure moves toward the trailing edge with increase of angle of attack. This movement is not the case with most air foil sections, as indicated in the sketches in Section 2. In the upper sketch the mean line that divides the cross section of an airfoil is drawn. Airfoils having similar mean lines will have similar aerodynamic characteristics.

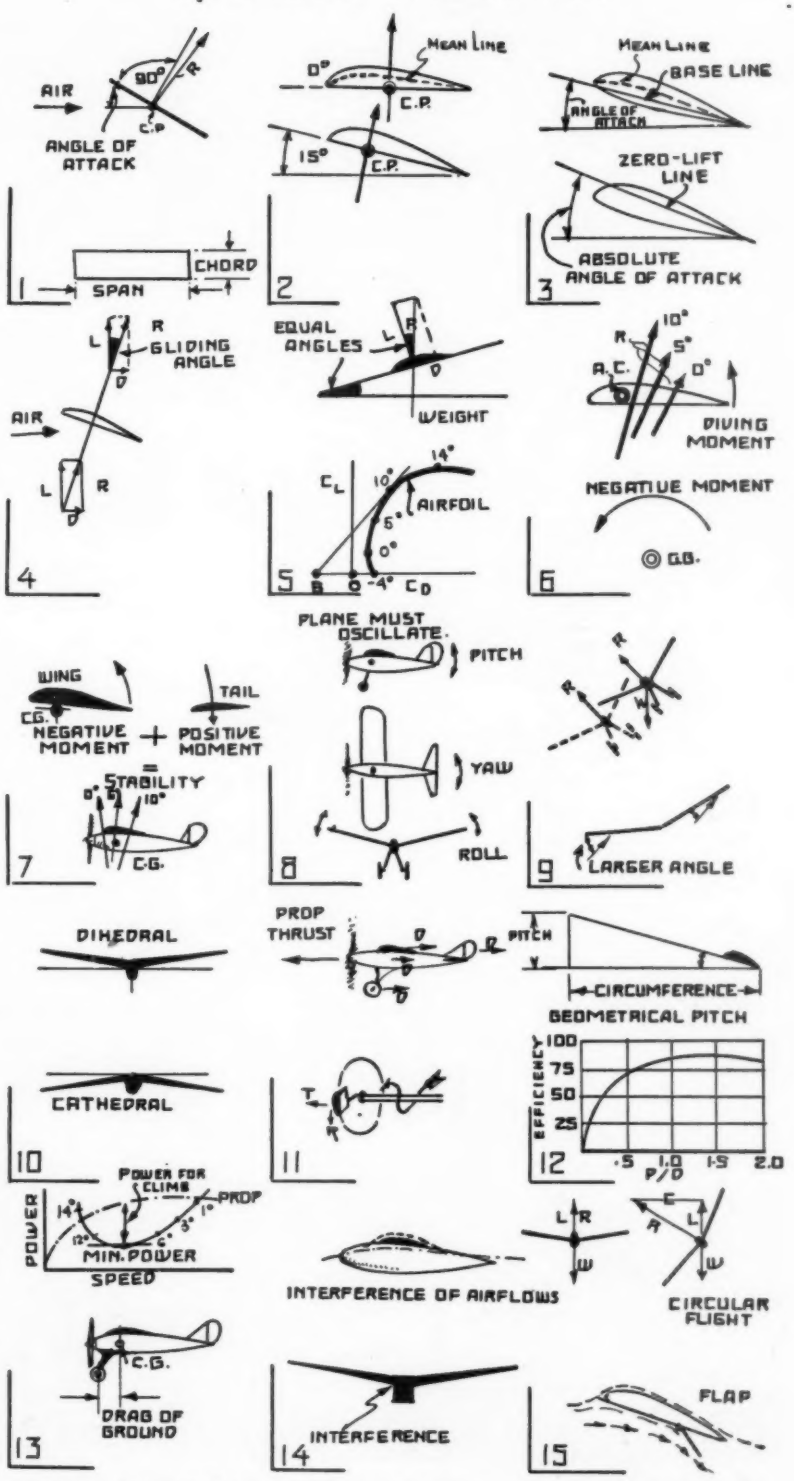
The angle of attack on an airfoil is measured from any arbitrary base line as in Section 3. The angle measured from the zero lift line is the absolute angle of attack. The angle used in rigging a wing is measured to any line of the structure, usually to the motor axis. This is the angle of incidence.

For use in performance calculations, the resultant is usually resolved into two components: the drag component, parallel to the air stream; and the lift component, vertical to the air stream. There is no center of lift. The resolution can be done on any point of the resultant as indicated in Section 4. The ratio of lift and drag components, or the slope of the resultant with the air stream, is the gliding angle. The airfoil or a combination would glide at a slope equal to the gliding angle as sketched in Section 5. Added fuselage resistance is indicated by the distance O-B on the diagram in the same section. The heavy line shows the drag and lift coefficients for various angles of attack.

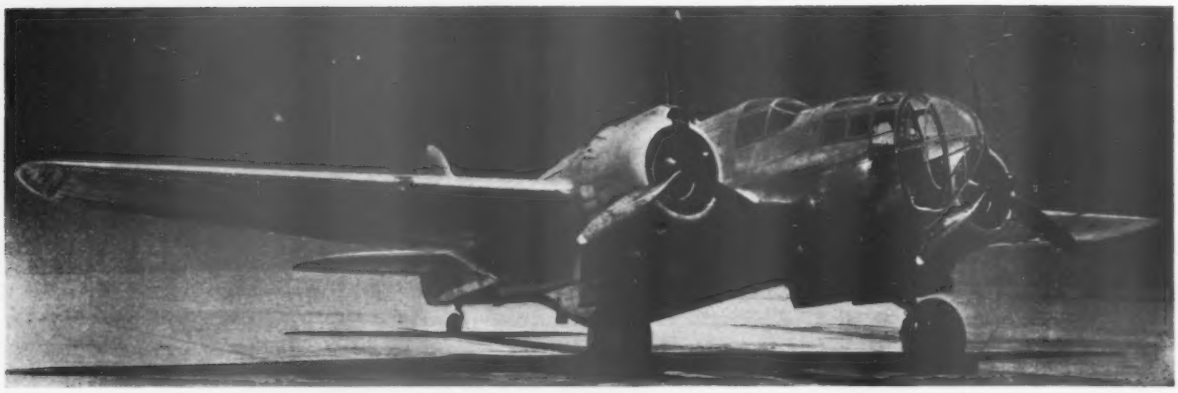
The upper sketch in Section 6 shows the vector diagram of an airfoil for three angles of attack. The point marked A.C. is the aerodynamic center, about which most of the resultants will give the same moment. The moment is usually negative. The moments in an airplane are measured about the center of balance (e.g.), a point about which an airplane assumingly oscillates. To counteract diving moments, positive moments are added by the tail to make the airplane stable. In a stable airplane the resultants are in the order shown in Section 7.

To make an airplane aerodynamically stable, its control surfaces must be larger than perfect stability would require.

(*Continued on page 84*)

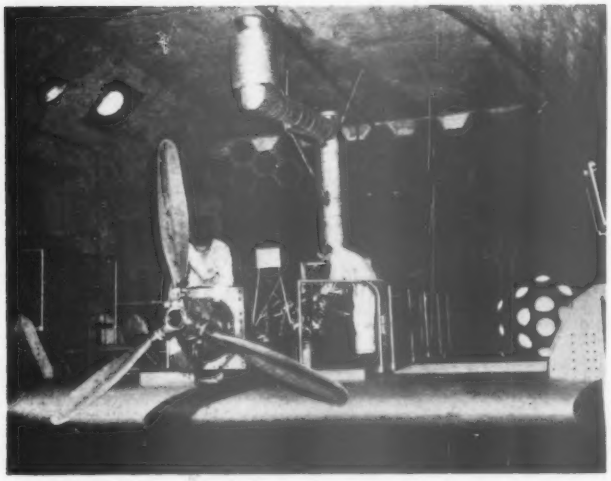


Various shapes of design in wings and fuselage as shown in sketches (above) illustrate flow of air over different surfaces and help aerodynamic study.

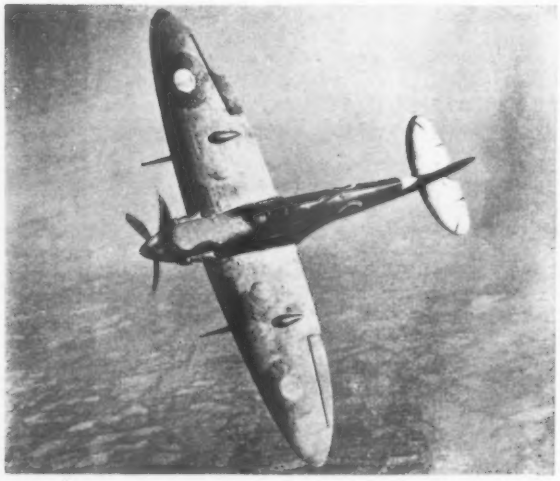


Now going into production for the RAF is Martin "Baltimore" medium bomber. It has two 1,600 h.p. Wright engines, heavy armament including a power-driven turret. U. S. has not ordered this model.

HAVE YOU SEEN?



About to undergo a vibration test is the new hydraulic propeller developed by the Aeroproducts Division of General Motors at Dayton.



Deadly new version of famed British "Spitfire" is armed with four machine guns and two 20 mm. cannon seen in wings.

New plastic-plywood floats for lightplanes, now produced at Elwood, Ind., have CAA approval. They sell for $395 per pair.

An advanced engineering student at the Ryan school recently designed this unusual twin-engined, tricycle-geared bomber.

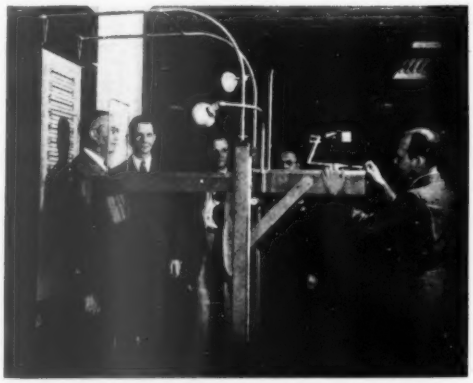
Latest Vultee design is this "Vengeance" dive bomber for RAF's Fleet Air Arm. Bombs are carried internally. The "Vengeance" will be built at Vultee's Nashville plant and subcontracted by Northrop.

Expected soon to go on the market is the Monocoupe 90AF, similar to older model, but using 90 h.p. Franklin.

Above is one of the first Bell "Airacobras" for the RAF. Contrary to popular belief, British have not named it "Caribou," will call it "Airacobra."

This is the first photograph to reach the U. S. of Britain's giant Short "Sterling" long-range bomber. The RAF neglected this type, had to buy Boeings and Consolidateds.

One of few pictures of a German bombsight is this recently received from the war zones. Sight is self-contained, uses no exterior sighting wires. German aim with it is reported good.



Recently installed in Martin factory is photo-identification device. Glenn L. Martin, president, was the first to be "mugged." Note his height: 5 ft. 9 in.

Of interest to Americans is the modern gun sight in a British "Hurricane" fighter (right). It is of the reflector type and incorporates an electrically-reflected image on the glass disc.

Ocean Flying Is Routine

(*Continued from page 46*)

Once aloft, flight deck routine follows the mechanical condition imposed by the flight time analysis. The captain studies the second officer's and flight engineer's report. He tries to keep the ship flying at its most efficient air speed; that is, at the speed which will give maximum miles of ground speed progress per gallon of gasoline consumed.

To execute a plan accurately, an easily usable performance yardstick is necessary. Ours is the "howgozit curve," now a formal designation for this type of chart. Developed by our ocean captains, led by Capt. Harold Gray (now chief pilot of our Atlantic Division), it presents to the crew aloft and the flight watch ashore a continuous flow of information as to the fuel reserve aboard the aircraft and the fuel required to complete the flight to destination or back to point of departure. Actually it consists of five curves. Using the path selected in the flight forecast and performance charts for plane and engines, a curve of miles vs. gallons is plotted, showing normal four-engined fuel consumption for the flight in hand. The second curve shows gallons vs. hours of flying. The third curve is of hours vs. miles. The fourth and fifth show miles vs. gallons for three-engined "ahead" and "return" conditions. The "point of no return" also is plotted.

All curves mentioned are drawn in solidly, indicating that they are based on the flight time analysis. As the flight proceeds, a constant record of the plane's actual fuel consumption is maintained alongside the solid lines by the first officer. Deviations indicate to captain and terminal flight watch officer whether the flight is proceeding satisfactorily, or whether some factor—such as changing wind conditions—is raising fuel consumption and specifically at what rate.

I have described a technically typical flight. Others have detoured several hundred miles in mid-ocean to avoid predicted areas of high intensity storms. One flight on the mid-Atlantic route in mid-winter actually made its scheduled crossing of a few minutes less than 24 hours in the teeth of headwinds averaging 41.9 m.p.h. for the entire course. Individual mail loads of 13,000 pounds and passenger loads in addition to mail of 33 eastbound and 35 westbound have been carried. Although the war has transferred some 30 per cent of the total transatlantic mails to the airplane, our service has been able to carry all offered us. The war also has swept potential foreign competition from the field, leaving only the United States to carry on development of transoceanic air transport. As Pan American's history shows, this has been and will continue to be a difficult, problem-studded job.

European international air communications began developing swiftly during 1919, but it was October, 1927, before Pan American Airways opened the first American international air service, a 90-mile route between Key West and Havana. Only ships with multi-engined power plants were used; this insured ample power reserves in case of one engine's failure during over-water flight. Lacking marine-type aircraft, Fokker F-7 tri-motored landplanes—which could maintain flight on two of their three 220 h.p. Wright *Whirlwinds*—were used. Cruising speed was 90 m.p.h.; gross weight-carrying limit, 9,700 pounds. Wood-type wing construction and flotation gear added safety. Mail and eight passengers were carried. These and the next year's larger and improved Fokker

"It's that new-fangled excursion flying boat . . ."

F-10 tri-motored transports enabled us to extend service through the West Indies as far south as Puerto Rico.

Later, development of the Sikorsky S-38 amphibian (first American marine air transport) and the Consolidated *Commodore*, first twin-engined American flying boat, made possible further extensions and establishment of two trunk line routes between North and South America, following the Caribbean's perimeter. By 1931 direct service was effected across the 631-mile open-water sector between Jamaica and the Panama Canal Zone. This, a *Commodore* feat, was the most ambitious overseas operation so far undertaken by scheduled air transport.

To carry commercially practical loads over such a long range safely, however, required four-engined marine aircraft much larger than any so far projected. A step toward this goal was the Sikorsky S-40, which entered service in 1932. These ships' impressive size—they could carry 40 passengers on the Miami-Havana run and had a 34,600-pound gross weight—did much to break down prevailing public resistance to over-water flying. Built to our specifications, they also were a convincing demonstration to designers and manufacturers of the potentialities of increased size and horsepower in aircraft for international—and, particularly, for over-water—operation.

The S-40's provided us with many new lessons in large-scale aircraft's maintenance and surface handling. Since tropical static conditions forced us to use radio telegraphy instead of voice communication, the standard Pan American crew always had consisted of at least two pilots and a radio operator. Now, using four-engined aircraft, we added a fourth member, an engine specialist. We undertook to adapt celestial navigation to air transport purposes and to increase our radio direction-finders' range. We also supplemented our weather service organization extensively.

The Caribbean became a working laboratory in which, under large scale and actual operating conditions, we were able to gain the invaluable experience which was to form the basis for future trans-oceanic operations. By 1934, our initial pioneering effort was completed and service extended to every important country and colony in the three Americas.

Even while these airways were extending southward, development toward a transatlantic airline was well under way. Research expeditions to Iceland, Greenland, Labrador and Newfoundland checked climatic and meteorological conditions. Company engineers conducted similar surveys at the Azores and points in Europe and Africa. Supplementary flight surveys were made in the far north. Special weather stations aboard transatlantic liners helped develop a comprehensive weather forecasting and reporting service for proposed ocean flights.

Meantime, aircraft and power plant development were proceeding apace. The four-engined Sikorsky S-42, until recently nucleus of our South American express service, was completed in 1934. The Martin M-130 (the original *China Clipper*), another four-engined ship, gave us means as early as 1935 of establishing a transatlantic service, although other factors made this impossible at the time.

Westward, across a chain of U.S. island possessions, lay an 8,683-mile route to Asia's coast. Unable to move forward on the Atlantic front, in 1934 we applied our aircraft, trained personnel and operating technique to establishing a transpacific airway. Save for wind and weather conditions, this presented greater problems than the Atlantic, but we determined to set up complete bases at our five proposed ports-of-call—Honolulu, Midway Island, Wake Island, Guam and Manila—in a single expedition. On

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March 27, 1935, our colonizing steamer, the *S.S. North Haven*, left San Francisco on its four-month assignment. Even before the steamer reached Midway early in April, the Pan American clipper—a specially fitted Sikorsky S-42—took off on a round trip survey flight of the 2,402-mile sector lying between San Francisco and Hawaii. As each succeeding island base was set up, this same clipper conducted flight survey of the route's remaining legs: Honolulu-Midway, 1,304 miles; Midway-Wake, 1,185; Wake-Guam, 1,508; Guam-Manila, 1,589. Then, on delivery of the Martins, we began the first scheduled transoceanic passenger air service.

Early in 1936 we contracted for six four-engined Boeing flying boats, to be known as B-314's. Specifications called for ships of 84,000 pounds gross load rating, capable of carrying 30 passengers in berths under average conditions across a 2,000-mile non-stop flight sector. New features included companionways to permit accessibility to engines in flight and a flight deck ample for an entire flight crew, located above and completely separated from the passenger compartment. With these, we could improve our Pacific service substantially and prepare even more adequately for inaugurating Atlantic flights.

An important transatlantic flight problem was that of obtaining permission to fly to and over other powers' land and waters. By 1937 this had been arranged sufficiently to start transatlantic survey flights.

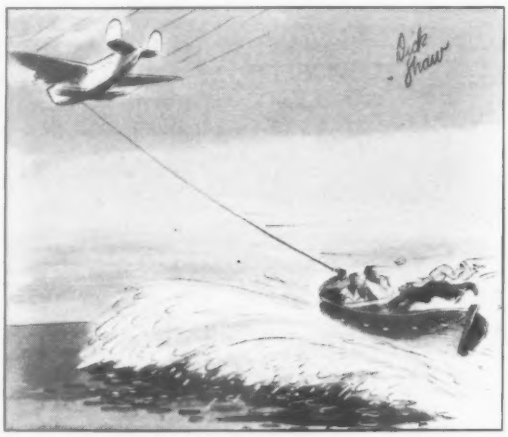
Two general routes offered best possibilities for a successful initial service first, the Great Circle route to Great Britain and France via Canada, Newfoundland and Ireland; second, the Mid-Atlantic route, from New York via the Azores and Lisbon. Weather conditions limited Great Circle route winter operations possibilities.

Between June and September, 1937, we conducted five engineering surveys, using an S-42 especially equipped for flight research. Made under strict transport routine, these surveys familiarized flight crews with base conditions, as well as confirming the weather difficulties involved and the adequacy of our ocean flight techinque. West winds at altitudes at which we planned to operate proved even stronger and more stubborn than we had anticipated. Ocean swell added difficulties in the Azores, an essential refuelling point.

On May 20, 1939, the *Yankee Clipper*, first of our new Boeing B-314 ocean transports, headed out from New York for Europe on official flight No. 1, instituting the first scheduled airplane mail service over the Atlantic ocean. By June 24, scheduled service had been inaugurated across both Great Circle and Mid-Atlantic routes. By July passengers, as well as mail, were being carried in both directions on regular weekly schedules.

Three months after the service started, the imminence of war forced withdrawal of the Great Circle terminal from Southampton to Foynes, in neutral Ireland. The Mid-Atlantic terminal was changed from Marseilles to Lisbon. Early October brought the Great Circle's suspension for the winter. Both routes then were consolidated into a single New York-Lisbon airway, with an intermediate stop at the Azores. By spring the war and passage of the Neutrality Act had made it impossible to resume the Great Circle line. All flight operations since have been conducted across the Mid-Atlantic and southerly routes. With the war, however, the airway became one of the most important arteries between the Western Hemisphere and Europe. Traffic demand climbed swiftly to 10 times the original estimates.

Six additional B-314's were ordered for delivery early in 1941. Four of these have been delivered, of which three were transferred to the British government. The remaining two should enable us soon to increase service from three to six round trips weekly. Meanwhile, increased engine, propeller and operating efficiency and removal of all non-essentials has upped payloads. Instead of operating non-stop from Bermuda to Lisbon, we schedule flights in and out of Horta, the Azores, whenever elements permit. This raises payload 5,000 pounds eastbound and 3,000 pounds westbound.



"The admiral won't step foot in an airplane, sunken battleship or no sunken battleship! . . ."

During the winter of 1940-1941 a new southerly route was scheduled, to dodge the storms and strong west winds of the north and the poor harbor conditions at Horta. Heading south from Lisbon, the clippers landed at Bolama, Portuguese Guinea, West Africa, then turned west to Belem, Brazil, thence north to New York via Trinidad and Puerto Rico or Bermuda. Although 4,085 miles longer than the Lisbon-Azores-Bermuda-New York route, increased costs were offset by increased percentage of schedules completed and increased number of passengers, in addition to mail. By overflying Horta on eastbound trips throughout the winter and following the South Atlantic route when westbound, the clippers completed 50 per cent more westbound crossings than during the previous winter. Of 25 trips scheduled, only 14 were completed in three winter months of 1940. In 1941, 21 were completed via the southern route, a record of 84 per cent performance, as against 56 per cent for 1940. In the winter of 1940 only 286 persons were carried from Lisbon to New York. In 1941, this total reached 471 for the same period, despite a mail load increase from 33,247 pounds to 45,404.

Aircraft development continues. Hardly had our initial schedules been instituted with the Boeing B-314's when manufacturers were invited to submit bids on design and development of a new type clipper, indicated by our experience to be the next step. Construction contracts were let in June, 1940, with first deliveries scheduled for early 1942. While I cannot discuss these ships' technical details, I can cite problems we had in ordering them.

1. Between October 1 and April 1 sea-swells at Horta exceeded three feet on 35 days per 100; on 57 days per 100 they exceeded 2½ feet. This delayed schedules. The solution is to advance the practical commercial range of transoceanic aircraft to permit non-stop operation.

2. Westerly winds' consistently high velocity, particularly during the winter months, contributes to schedule cancellations. Even when such flights are technically feasible, unreasonable payload restrictions are imposed. Wind aloft records indicate cruising speeds at least 75 to 100 m.p.h. greater than those now available are desirable.

3. The recurring North Atlantic coast ice problem points to landplane operation advantages. Landplanes also could permit direct service between metropolitan airports.

The aircraft we now are waiting for are by no means offered as "ideal" transatlantic aircraft. It will be many years before depreciation and not obsolescence will be our concern. We have immediately before us advancing researches in such fields as boundary layer control, exhaust heat utilization and unorthodox power plants, to mention just a few.

The need for efficiency distinguishes a long-range ocean transport from other civil aircraft. Thus, the latest type short-range landplane—the Douglas DC-3—can fly 750 miles with 45 minutes' fuel reserve, carrying a full load of 21 passengers. For this, a normal assignment, it carries 450 gallons of fuel, weighing 2,700 pounds; this represents only 11 per cent of its gross weight or 33 per cent of its useful load. By comparison the Boeing "314"—operating over a 2,400-mile route with 4½ hours' fuel reserve—requires 4,000 gallons (24,000 pounds) of fuel, which constitutes 29 per cent of its gross weight and 73 per cent of its useful load. If the DC-3's efficiency could be increased one per cent, payload

(*Continued on page* 100)

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This unity of purpose and unity of effort is born of a faith—a faith in Northrop planes—a faith in the Northrop organization—and faith in the form of government whose principles we are "all out" to defend.

Such is the spirit at Northrop. It always was. It always will be.

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The Russian Air Force

(*Continued from page* 16)

prototype should prove excellent. The others:

SB-2. Low-wing, twin-engined monoplane. Engines, 750 h.p. M-25. Speed, 264 m.h.p. Bomb load, 1,100 pounds. Armament, five machine guns.

ZKB-26. Mid-wing, twin-engined monoplane. Engines, two 1,000 h.p. M-8. Speed, 315 m.p.h. Bomb load, 6,600 pounds. Armament, two two-gun turrets, two wing guns.

There have been four installations in the ZKB-26 (initials of Z. K. Borkovsky, who has been wholly or partly responsible for the design of the "I" fighters.) The *Katuskas*, as they were known in Spain, were powered by either Hispano-Suiza or *Cyclone* motors. The model most widely used in Finland used Gnome-Rhones. The newest model, a few of which were used in Finland, is powered by neatly streamlined liquid-cooled engines, probably the Mikouline type. British reports have this latest model carrying 37 mm. cannon for use against tanks, but this is not verified.

Heavy bombers are the backbone of the Independent Bombing Force. Latest types on which I have any data are two four-engined, and one twin-engined ship. The hottest is called "an 'accurate' modification of the *Flying Fortress*", powered by four M-27 radial motors and having a top speed of "nearly 300 m.p.h. with several tons of bombs." Strange language. The new twin-engined type, an early prototype of which made the Moscow-New York-New Brunswick flight in April, appears to be a cross between the Douglas B-18 and Martin "166" (this much is evident from the photos). The ship averaged 217 m.p.h. on the transatlantic flight while overloaded with fuel. The standard bomber should be fairly fast and carry a good load over a great range. It is armed with two turrets. Last is a slow but otherwise good ship, with a queer-looking nose.

TB-3. Four-engined, mid-wing monoplane. Engines, four 950 h.p. M-34. Speed, 220 m.p.h. Load, 11,300 pounds. Range, 3,700 miles. Armament, turret, three gun emplacements. Crew, six men.

These combat airplanes are supplemented by a number of Seversky (now Republic) *Convoy* two-seater fighters, the mentioned Vultee attack planes, three Consolidated PBY-2 type flying boats, three Vought-Sikorsky S-43 amphibians and several Douglas DC-2's and DC-3's. Faithful copies of the PBY boat have been built during the past year at Plant No. 31 near Tagaurog. They are powered by twin M-27 engines and are designated as "N-243". Aside from this American contribution, supplementary aircraft are to be found in large numbers. These include reconnaissance, ambulance, cargo and transport planes, and trainers.

The procurement of personnel to fly these airplanes does not appear to be much of a problem, thanks to the work of the *Osoaviakhim* (Society for Cooperation in Defense and Aviation-Chemical Development) in its "aero clubs" and gliding and parachute associations. This work will be discussed later, however. In December, 1936, a 150,000-pilot training program was launched and this goal was reported to have been attained by the spring of 1938. An equal number probably have been turned out since then; how, we shall see presently. In Marshal Klimenti Voroshilov's report to the March, 1939, Communist Party congress, he stated that the air force personnel had been increased by 138 per cent over that of 1934. In this latter year, there were 11 large flying schools in operation, not counting *Osoaviakhim* centers. Regular procedure has been, as was the case in the U.S. Naval Air Service before expansion, to train pilots to master both big bombers and hot fighters. This may have been discontinued since the war. In any case, it may well turn out that Stalin's ace in the hole is his great reserve strength of capable pilots.

"He says we don't go about our bombing efficiently. He'd like to give us some pointers he learned in the teamsters' war . . ."

Contrary to recent reports, there is, according to my sources, no shortage of either ground personnel (mechanics, armorers, radio operators, meteorologists, et al.) or aircraft factory workers. This is borne out by the fact that from 800,000 to 1,000,000 youths between the ages of 14 and 18 are conscripted annually for industrial training, after which time they work for the government for a period of four years. (The only deficiency that affects plane production is a shortage of suitable machine tools.) Obviously, not all or even the majority of industrial conscripts are engaged in aeronautical pursuits, but enough of the trained workers most certainly are diverted to aircraft plants to assure uninterrupted production.

Research is responsible for the manner in which a fundamentally agricultural nation has come to produce fine airplanes in quantity and quality. The Soviet system has been to modify foreign designs or copy them outright, rather than to develop their own planes and engines, although there are a few domestic products. The Toupolev motor is modeled along the lines of the Hispano-Suiza and Rolls-Royce. The Mikouline is an outgrowth of the Curtis *Conqueror* plus supercharging. Research is conducted by the ZAGI (Central Aero-Hyrodynamic Institute) and its branch, the VAIM. The former concerns itself with the design and construction of experimental military and civil aircraft and the testing of these planes and the VAIM carries on research on materials. Experimental engine work is handled by the Scientific Motor Institute through its branch, the ZAIM. that the Soviets take their research seriously is evidenced by the fact that, in 1938, some 4,000 technicians—among these many young American engineers who had graduated during the depression years and were unable to find employment here—were active in this field.

National airmindedness is the result of the work of the *Osoaviakhim*, formed in January, 1927, by the combination of the *Oso* (Society for Assistance to Defense) and the *Aviakhim* flying society. With the possible exception of the trade unions it is the largest organization in the USSR. Citizens of both sexes who are "active participants in socialist construction" may join *Osoaviakhim* upon the payment of a nominal initiation fee and dues, since the society is supported by donations and government subsidy.

New members are taken into elementary "circles" which provide courses in military specialities and model building, parachuting and gliding. Motorless flight began as a sport in 1921 when several students at the Air Academy formed a club, but it was not until the society sponsored gliding that the idea really caught on. After a course in model building, beginners receive theoretical training and ground practice, using primary gliders built in *Osoaviakhim's* own factory. Then they go on to advanced air work and soaring in secondaries. By 1936, 20,000 had become licensed glider pilots and 40,000 more were enrolled in the elementary and advanced gliding schools. The use of multi-seater gliders and glider towing commenced during that year. Apt soarers are sent to the famous Koktebel gliding

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school in Crimea for specialization and tactical work.

Parachuting, however, is the principal aerial activity of the *Osoaviakhim*. The society launched an educational program in 1929 and 400 instructors-to-be were given advanced training in a new branch of the Military Air Academy. In August, 1933, 62 jumpers floated to earth in the first and greatest (then) mass leap ever attempted. Students were taught the theory and packing of 'chutes, then they made jumps with captive parachutes from low towers. By the close of 1940, upwards of 5,000,000 jumps had been made from towers and 1,000,000 'chute descents had been made from aircraft by *Osoaviakhimites*. There were nearly 1,000 towers on trade union recreation grounds, public parks, and rural centers. Jumping became the national pastime.

Licensed 'chutists may be sent to the Tushino school near Moscow for tactical training. It was in mid-summer of 1935 that the Soviets demonstrated the use of a parachute army and, in the famous October, 1936, maneuvers at Moscow, 5,000 'chutists armed to the teeth bailed out of a sky-darkening mass of transports and bombers to amaze military observers—including representatives of Hitler.

Many gliding and parachute graduates became licensed pilots at the society's aero club, and 90 per cent of the Red Air Force personnel (in 1938) was *Osoaviakhim* alumni. Flying officers are trained at the Military Air Academy and its several branches. Their leader is a man with whom the Nazi High Command would, avowedly, rather not have to reckon. He is the world's youngest air commander, Lieut.-Gen. Jacob Smushkevich, dark-haired, 39-year-old Lithuanian Jew whose family suffered hard and long under the earliest pogroms. At 19, he was a champion aerobatic pilot and held the title of Political Instructor of Aviation. Today, at 39, as Chief of the Military Air Forces of the USSR, he can still match wing tips with the best of his young "falcons," as the Red airmen are known locally.

END

Factory Fire Hazards

AIRCRAFT factory fire hazards and suggestions for their minimization, or for combating fires should they occur, are listed in the 75th anniversary bulletin of the National Board of Fire Underwriters.

"Quantities of aluminum and magnesium are used in such plants," the report points out. "These metals are combustible and when afire create a serious fire department problem. Water when in contact with these metals, decomposes and liberates hydrogen, a dangerous explosive. For proper extinguishing purposes sand, talc, or mixtures of the same must be used.

"There is usually a woodworking department, with highly combustible woodwork and an accompanying dust explosion hazard. Electric welding and oxy-acetylene welding present spark hazard. If installations are poor, acetylene or other flammable fuel gas may escape. Engine testing produces highly heated friction sparks.

"Spray painting employing quick-drying thinners or containing nitrocellulose should be in a separate portion of the plant, where there is sufficient ventilation to carry fumes safely outside. Storage and handling of lacquers and thinners requires attention; they should be in a separate paint storage and mixing room.

"All combustible rubbish and residues should be cleaned up daily and removed to a safe place outside of the building.

"All firefighting equipment—stand pipes, chemical extinguishers, fire pails and sand pails—should be inspected and tested frequently, as should automatic sprinkler systems.

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In cooperation with radio station KMPC, Beverly Hills, Cal., 710 kilocycles, FLYING AND POPULAR AVIATION is presenting a special weather service for California pilots. Twice daily including Sunday (at 8:15 a.m. and 2:30 p.m., Pacific Standard time), KMPC broadcasts an up-to-the-minute official forecast. All forecasts are put on the air no later than 15 minutes after the official U. S. Weather Bureau report is made. This is the first time any aviation magazine, working with a radio station, has presented authentic weather information for private flyers.

AIR FREIGHT
INDUSTRY OF THE FUTURE

DEFENSE has jumped the tonnage of air cargo. Precious machinery and tools are literally flying to the job of production. This has vastly accelerated the growth of a great industry of the future. By April, 1941, 111,000 shipments per month of miscellaneous goods were going by air.

Machine parts, printing plates, newsreels, styles are common cargo for air shipment—and commodities ranging from gardenias to furnaces are being transported by plane.

Air express service extends across the continent and the Pacific Ocean; and from Alaska to the Argentine. TIME Magazine ships 20,000 copies weekly to Latin America—they are on the news stands of Buenos Aires Monday, three days after the magazine goes on sale here.

In fifteen years, delivery speed by air has doubled; rates have been cut two-thirds; mileage flown has multiplied ten times over. As yet, however, the movement of freight by airplane is still an infant industry. Lower rates will come through new low-cost cargo planes and other developments; the quickening pace of United States production will continue to put more cargo in the air.

The development of this industry will call for more and more planes—and technically trained men to keep them flying.

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Lady Ace

(*Continued from page 47*)

borrowed a ship from Norman Larson—a Fairchild "24"—in May of that year. She managed to pull the ship up to 18,700 feet for a national record for planes of the first category having a cubic inch displacement of from 379 to 540. The plane was standard in every respect.

For her most recent record, Grace used a 65 h.p. Taylorcraft. She doesn't hand herself much for getting up to 24,311 feet but rather blames it on the ship, which she calls a great little plane. It, too, was standard in every respect. As on her previous flight she wore a BLB Mayo Clinic Mask to get her oxygen supply.

"How does it feel? Well," she says, "there isn't a lot of feel to it. You're up there and things look very small down through the haze which usually exists in Southern California. Even with oxygen, you're apt to get a little dizzy and upset unless you follow a tip given to me by Max Constant. That is to start inhaling oxygen about 45 minutes before you take off. Then you suffer no ill effects."

Max Constant, racer, at one time associated with Jacqueline Cochran, who also hopes that women will begin to get a break in aviation before long, is now busy teaching Robert Taylor, the movie star, to fly. But, to continue with Grace!

"The main thing in high altitude flying—getting everything you can out of a ship—is to be patient. You have to be able to be satisfied with about 10 feet per minute and be very careful not to nose up too fast. You'll stall and mush, losing altitude rather than gaining, if you get in any kind of a hurry."

You have to dress for cold weather, too. On the last hop, the temperature got down to 12° below zero during a flight which lasted 2 hours and 45 minutes. And the windshield split vertically.

"I've figured that out," she explains. "I was flying into the sun part of the time. It's very bright up there and heats quickly. Then I turned away from the sun and the temperature against the shield dropped to 12° below. The sudden change did the cracking."

At the top of her climb she was very, very close to stall. She had it turning wide open, of course, getting every ounce of power it would deliver.

"It ran perfectly normally," she says. "I didn't even have to use carburetor heat, due to the fact that the air is very dry at that altitude. I had had to use the carburetor heat at lower levels, however."

Grace has made a pretty careful study of air conditions, and believes that any plane will climb higher on a clear day than on a cloudy one.

"I think I could have added several hundred feet to the Fairchild record," she says, "if the day hadn't been cloudy."

Soon, she hopes to be able to get the use of more powerful ships, to go up really high, stay up a while, catch insects on greased plates, take a lot of instruments along and make even D. W ("Tommy") Tomlinson look to his laurels.

"And," she says, "at the same time I hope I get a little recognition—not for myself but for all women who fly—which will result in jobs which we know we can fill."

What jobs? Well, not long ago (just between us) she tried to get a job as co-pilot with a large manufacturing company which is now testing several planes a day. She was turned down right then and there because she's a woman. She contends that her sex has proved down through the years that it can do just about everything in the air that a man can, with the exception of war flying.

"And I wouldn't try that," she says. "But I could—and hundreds of other women could—ferry airplanes. We hear reports that women are doing that in Great Britain today."

If the women needed a champion for their rights, they couldn't pick anyone more intelligent than Grace. She comes from a family of brilliant people. Her father was a chemist, a lawyer, a writer on chemical jurisprudence, a minister and directed biblical motion pictures. Her sister, Harriet, has danced professionally, has gone around the world photographing dancers and has written many successful books for children. And her brother, whom she interested in flying, is a test pilot for Fairchild at Hagerstown, Md. (Darn it! exclaims Grace. He's only 22 years old. But he's a man.)

Grace, born in Springfield, Mass., hasn't done so badly, either. In fact, she's proved herself in several fields other than aviation. The family came to California when she was seven and she attended Westlake, Marlborough and Cumnock schools in Los Angeles. Later she went to Rosemary Hall at Greenwich, Conn., and to Scripps College. She studied music and took special courses in composition and orchestration at the University of Southern California. She plays both the violin and piano, has studied sculpture, drama and stage technique. She has made three trips to Europe, the latter by herself six years ago, studying at the Sarbonne. Her career was interrupted by a serious illness. She returned to America, began writing children's books and, when she started flying, she was a writer on the Walt Disney staff.

"When I was young," she says, "my

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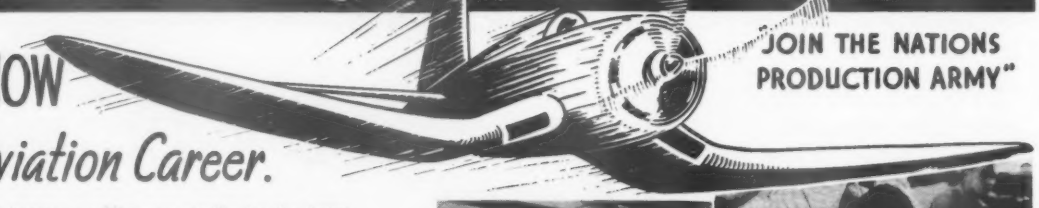

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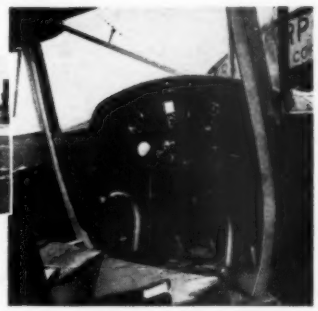

Interior of 8D-1 shown at right

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family went to Florida quite frequently. One time we stayed at Pensacola. My mother says that I was about four then, and that I spent all my time watching airplanes, talking about them and wanting to ride in them." Her mother opposed her interest in flying—not because she thought it was dangerous but because she thought that a woman who flew was traitor to her sex.

Mrs. Huntington has since relented and Grace has proved she can be charmingly feminine, even upon discovering that a grease monkey has failed to gas a plane or has left a cotter pin out of a wing strut bolt. She longed to fly all during grammar school and high school, even in the strictly ladylike feminine surroundings of exclusive schools. Once, when she was 16, she flew to Avalon, 23 miles off the coast of California in a flying boat operated by the Wilmington-Catalina Airline. Later she had a "joy hop" at Union Air Terminal, where she now works, when she was about 19 years old.

"I got Charles—my brother—interested in flying when he was 17," she says, almost ruefully. "I found out where he could go to school, how much it would cost and all about it. I finally sent him to Joe Plosser. He took to it like a duck to water and soloed in eight hours."

As soon as Charles got a Fairchild, a gift from his mother, Grace began pestering him. But he didn't want to teach a member of his own family. However, he did let her have the plane now and then and she received her instruction from Burleigh L. Putnam, now a CAA inspector stationed in the east.

She soloed in *seven* hours. This was on July 6, 1936. In the following January she got her private license. This didn't satisfy her at all. She started building up time, studied for her instrument rating, learned about motors, meteorology and everything else she could, getting some of her information here, some there but most of it from Jim Barwick, former motion picture stunt pilot and Lockheed test pilot. In spite of the fact that she still wrote for the Disney studio, she found time to go places, too. Once, she went to Honolulu. Again, to Mexico City via the airline. When she had 100 hours she flew to Chicago and back with her brother, doing her share of the flying. In 1939, she flew with her mother and her brother to New York City, where they embarked on a trip around the world. She flew the Fairchild back alone.

She got her instrument rating. Then came the endurance flights—the record-breaking ones in the Fairchild and the Taylorcraft. By now, she had decided that she'd rather fly than do anything so she dropped all her other activities. Finally, she even quit the writing job with Disney. She went east once to pick up a Taylorcraft at Alliance, O., returned to get a Ranger Fairchild and fly it out to the Boeing school at Oakland.

Then, a few months ago, the job with Paul Mantz turned up and she went to work with a will, flying her allowable hours as an instructor right up to the hilt.

"I'm grateful to Paul," she says, "for giving me a chance to prove myself. And I don't feel that I've done badly. So far, no man who has dropped in to see about flying instruction has changed his mind either at sight of me or after flying with me. I do hope, however, that other types of jobs will open up for women, as well as opportunities to get the necessary instruction in motors, maintenance and the like. If women are going to fly they must have real incentive. A great many women who want to learn to fly hold off because they can't see where aviation will return a living to them. The field must open up to them if we are to have a worthy and worth while feminine representation in the business."

END

Radio Beacons "Down Under"

AUSTRALIA has installed ultra-high frequency radio beacons at her principal airports for commercial airlines' direction-finding apparatus.

Ambitious Mechanic

(*Continued from page 33*)

ever he could get away from the canned goods. He joined the National Guard which gave him an opportunity to learn about different types of engines and planes, about maintenance and flying tactics. Here was a boy who didn't do the mopping up just to get an occasional airplane ride.

It was in April, 1928, when he went to work for Western Air Express as a grease monkey. His experience and his application to the work carried him through a whirlwind apprenticeship. Within a year he was not only an accomplished mechanic but a crew chief. During the following year the airline, financed with Guggenheim funds, operated between Los Angeles and San Francisco over the model airway carrying passengers, mail and freight. The crew on tri-motored Fokkers in those days consisted of pilot and flying mechanic. Gove was one of the first flying mechanics in the country. He kept the log books, serviced the ships on the ground and supervised maintenance of the planes. That's quite a picture when contrasted with today's transport. When they land, air conditioners are attached and mechanics swarm over them to check instruments, engines, radios and appearance. Cleaners tidy the cabin. Others gas the planes. Still more personnel handle cargo and passengers.

But this is 1941 and Orm Gove instead of being responsible for the safety of one plane sits at a desk and guides many of them through the air at once. This is a job he can do because for 12 years he has learned the business as it progressed. Spectacular success stories abound through the aviation industry, stories of men who have entered aviation and overnight became famous. But Orm Gove is not spectacular. His success has come through determination to succeed the hard way which is to know as much as possible about every phase of the busi-

Photograph courtesy Lockheed Aircraft Corp.

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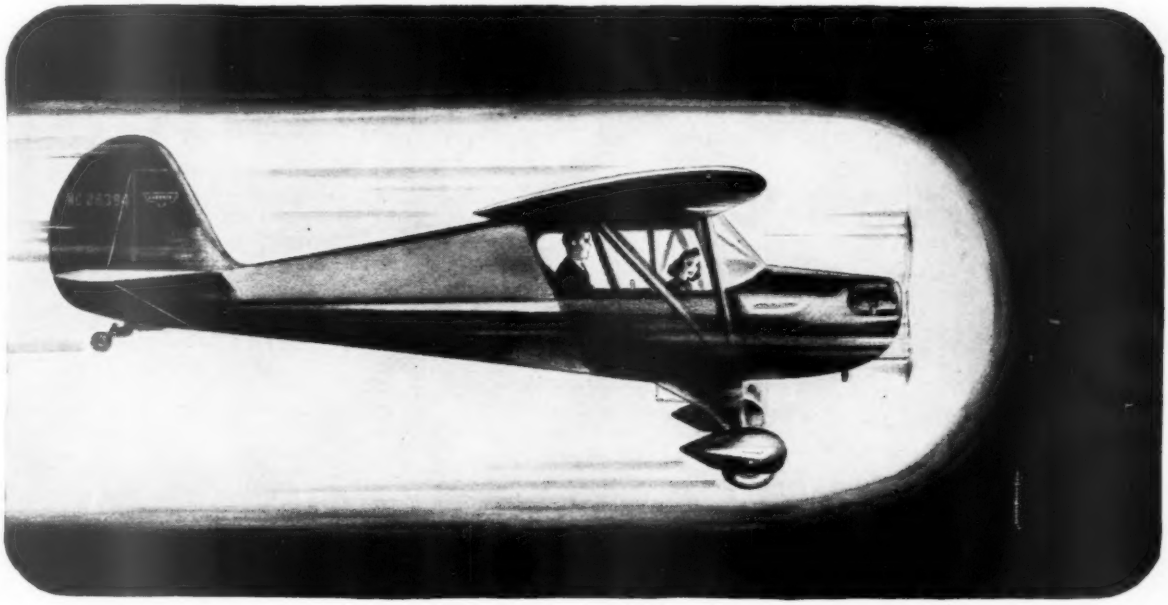

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*Name*_____ *Age*____

*Address*_____

*City*_____ *State*_____

ness than anybody else and then to apply what he has learned. But Gove won't tell you anything like that. He's so modest that many of the men with whom he works don't know the story of how he worked up from the lowliest job to one of the most desirable.

In the air transportation business dispatchers' reputations among their confreres are based on the amount of strain their nerves can take without being reflected in their tempers. Gove is unbelievably level-tempered. He seldom allows himself to get angry but when he does "Goldurn!" is the strongest of his expletives. He neither smokes nor drinks, probably because there is never a moment when he has nothing to do.

"I didn't have much time to pick up bad habits when I was younger," he says. "When I wasn't working on my steady job I was piling up hours or puttering around with my own planes. By the time Western Air Express merged with TAT I had about 1,200 hours logged and had earned my commercial license."

Shortly after that the Bureau of Air Commerce decided flying tri-motor Fokkers and Fords was too big a job for one man to handle and required that airlines have two pilots on every plane. So Orm just naturally became a co-pilot, a position he retained for five years. During that time he flew between Los Angeles, Albuquerque and Salt Lake City. As a first officer Gove saw many changes in the transportation industry. He flew the first four-motored planes to operate in the United States. "They were Fokkers," he recalled, "and they carried 32 passengers and a lot of freight. Were they good planes? I'll say they were good! But it didn't pay to use them; people weren't traveling by air in '29 and '30. It would break your heart to see those swell old ships now subjected to their greatest indignity. Imagine—they're used on the West Coast as gas stations!" It took 10 years for his faith in four-motored transports to be vindicated.

During his five years as first officer, Gove continued to buy and sell private planes. He has owned eight of them including two Trave Airs, a J5 Stearman, Monocoupe, Pitcairn, Keystone *Commuter* and two Wacos, one of which he has now—a 1935 cabin model with Continental engine. Of them all he liked the Monocoupe best. "It was the least expensive to operate and I had it fixed up with instruments and a hood to learn instrument flying. When I was transferred to Newark I flew from Los Angeles in the Monocoupe for only $36.35 including one night's storage in Amarillo." He says things like that with a shy pride as if he were bragging about a child.

Although he has never owned a "flivver plane" Orm gets excited about them. If anything will get the public flying, he believes, it's the little planes that don't require too much skill to operate—and what's more—that compare favorably in up-keep to automobiles. He sighed. "The biggest obstacle to owning a plane like that is hangar rent. Storage on a lightplane is way out of proportion to the other costs. But maybe something will be done to correct that situation."

Shortly after moving east Gove picked up his *Commuter*. It was in terrible condition. The all-metal fuselage was corroded to such an extent he wasn't sure it would be worthwhile to bother repairing it. But Casey Jones, whose mechanics' school is located in Newark, suggested to Gove that he be allowed to use the Keystone to give his students actual experience in repairing a plane. It would be quite a project for a group of student mechanics to take the almost hopeless plane and put it into flying condition. Gove assented.

"Well," he grinned, "it took them two years and I don't how how many man hours but they certain gave that amphibian a going-over. Those school kids rebuilt the plane—at no cost to me except for parts—and it handled beautifully. It sure had wonderful water-handling characteristics." He drifted off in thought. "But I traded it in recently for my Waco which is less expensive to operate."

Orm buys planes at the drop of a hat. He'll buy one if he thinks he can sell it at a profit, sticking to standard models because they bring a better price for resale. Lest any one get the impression Gove is money-mad, it should be understood that airline personnel don't make a lot of money and the manipulation of planes on his part is just his method of making the ships support themselves. But although he doesn't say so, there is a deeper reason why Orm moves from one plane to another. He is in love with flying and with planes and engines. He swings from one to another because he can't afford to collect them. In that way he gets the pleasure over a period of time of the hobbyist-collector. He likes to fly to football games and other sports events with his wife—who is not a pilot—because of the ease of it. He probably suppresses many a laugh between Floyd Bennett and New Haven when he looks down and sees the traffic.

Six years ago he checked out as a captain with a total of 5,200 co-pilot hours tucked away in his log books. He was flying in the east then between Newark and Kansas City. He survived the air mail cancellation and settled down to what he considers an easy job of flying 85 hours a month on the left side of the cockpit on DC-2s and DC-3s. He wanted not merely to be a pilot, but to sit right in the thick of the activity so he could see what was evolving over the whole system. The next move up was to dispatcher at Newark, where he would control for eight hours a day the busiest sector of the airline. That was in 1936.

He still has the same job only he's called a flight superintendent. He's at La Guardia Field and the airline's operations have more than doubled, which has made the job that much harder. But Orm doesn't mind. He's composed entirely of those qualities that make a good dispatcher. Mild-mannered and unflusterable, he has a respect for details that comes of long hours spent assembling engines. He has the viewpoint of a pilot and the caution of a mechanic. But above all his understanding of the operating problems and his ability to evaluate them make a powerful background for the man at the desk who gives orders to the men in the cockpits.

Orm Gove is typical of the new generation which has been presented the job of making air transportation safe and com-

AIR DEFENSE

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J. L. McKee, Berkley, Calif., American Legion Commander, and his Taylorcraft serving the local Council for Civilian Defense.

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fortable and selling it to the public. He's been flying planes constantly for 16 years—has spent more than 10,000 hours in the air—*and he's never had an accident!*

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END

I Learned About . . .

(*Continued from page* 43)

biplane. It had become second nature to to figure in about 500 feet for instrument lag, but it must have been far beyond that figure on this occasion. Third, I didn't think of the extra amount of altitude that would be consumed in the pull-out, due to the extra speed. All in all, I committed the one unpardonable flying sin: I just didn't think.

Feb. 20, 1939, was a beautiful Southern California winter afternoon of the type so well advertised by the Chamber of Commerce. Pt. Loma and San Diego bay passed lazily underneath as I shuttled back and forth between Oceanside and the Mexican border, making speed versus power runs at various altitudes. I was flying a Vought SB2U-2, the hottest dive bomber in the fleet at the time. We had had the planes about a month-and-a-half, but the installation of radios, sights, guns, emergency equipment and the host of minor items that constitute military equipment had kept them in the shops pretty continuously, so that I had had only 25 hours in the type—of which 17 hours had been cross-country from Washington to San Diego, with no opportunity for experimentation.

Our old planes, Great Lakes BG-1's, had been fine dive bombers, not too fast in the dive and very easy to pull out into level flight. With the adjustable stabilizer rolled all the way forward, it was possible to stay in a steep dive only by exerting considerable forward pressure on the stick. When you wanted to pull level, you merely relaxed the forward pressure and, as the nose started up and the speed fell off, applied back pressure on the stick. Several hundred hours of dive-bombing in these ships had made it instinctive to use just the right amount of pull on the controls for a rapid but non-blacked-out recovery. While I was flying BG's that instinct was of great advantage, but it contributed to my near-downfall with the new Vought.

As I have said, I had had only eight hours playing around in the SB2U's. Those hours had been spent on landings, formation flying and various other familiarization work, with only one or two shallow dives thrown in. After two hours of tedious work holding the airspeed and altitude constant and jotting down reading after reading on the knee pad, I was at 12,000 feet with the runs completed and a brand new dive bomber just waiting to dive. I was in the mood for a little excitement and, to my mind, there is no thrill like the feeling of a plane straight up and down, with wings taut and rigid in the howling airstream and the earth coming up at 500 feet a second. So, with 12,000 feet of altitude to be lost, a new sturdy plane underneath and a craving for excitement, what was more natural than a good screaming dive?

I eased the gun off and lost my excess speed by a gentle zoom that carried me up an extra 1,000 feet. When the ship seemed almost motionless in a near stall, I pushed the nose straight over and down. A pencil that had previously fallen down below the seat suddenly appeared floating in mid-air in front of my face. I hastily retrieved it and stuffed it into a knee pocket of my flying suit. The airspeed needle started to wind up around the dial and the altimeter hands began to unwind. As the speed mounted I eased forward on the elevator tab wheel to take the increased load off the stick.

By the time the altimeter showed 10,000 the airspeed needle was well into its second revolution of the dial. The wings were beginning to feel stiff and the airstream was a mounting crescendo as it pushed past the windshield.

Nine thousand. Eight thousand. The airspeed hand was progressing only slowly, but the altimeter was really winding down rapidly. I eased forward again on the Flettner control and the ship was trimmed in an almost "hands off" condition for the dive. It was good to be alive, feeling the ship's alertness to the speed, feeling the tenseness of the structure and sensing the terrific rush of air. The earth still seemed remote and only slightly closer than at the beginning of the dive. I put my eye to the telescope sight momentarily and noted that the ball was dead centered, showing that the ship was diving absolutely straight with no skid. Again I eased forward a little on the elevator Flettner to counteract for the now almost terminal velocity.

As the altimeter flicked past 6,000 feet I commenced the pullout. Why I decided to end the dive then I don't know, for it was several thousand feet higher than was normal for routine dive-bombing. The decision saved my life.

The airspeed indicator was well over 300 knots; how much more I can't tell you, for it would be disclosing confidential performance data. In any case, it was faster than I had ever been before and faster than I had any desire to go afterwards. I eased back on the stick with the instinctive BG technique. The nose seemed to be coming up at about the right speed. As the forward load on the stick increased due to the slowly slackening airspeed, I pulled back harder. My concentration was now on the water, rather than within the cockpit.

All of a sudden it dawned on me that the water was coming up at an alarming rate. We were still at a 45° angle at least and descending rapidly. It was going to be awfully close as to whether or not I got the ship level before we hit the water. By this point I was pulling back on the stick with about all the strength I had in my right arm, but it

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was readily apparent that it was not going to be enough. There was nothing to do but to break the Bureau of Aeronautics restriction against the use of Flettners during pullouts. The restriction was designed to prevent the probable overloading of the structure by overcontrolling with the extremely sensitive Flettner. But it was no time to worry about that possibility. I either had to do that or else fly right into the water. And water is just as hard as brick when you hit it at even a moderate speed.

I rolled the Flettner wheel back as rapidly but as cautiously as possible. The nose abruptly rose and the ship finally was in level flight at an altitude so low and a speed so great that the whitecaps were mere blurs as they passed beneath. I eased back a little more and, as the water dropped away beneath, glanced at the altimeter. One hundred twenty feet! The pullout had started at an indicated height of 6,000 feet and the dive at 13,000!

END

New Japanese Airliner

A NEW Japanese airliner, the HT-3, has been designed to carry two pilots, eight passengers and 240 pounds of baggage. Gross weight is four and one-half tons. The ship has two 400 h.p. engines and a top speed of 195 m.p.h. Although having a range of only 780 miles, the craft's ability to operate in and out of short fields makes it ideal for use among the Japanese islands.

Flight Computers

(*Continued from page 40*)

posite end—we will have the identical triangle that we set up on the computer for this problem (Figure 8). The heading is set on the compass rose, the wind face noted to 315° and the air speed arm placed on the wind face so that 250 intersects 30. The ground speed is read directly from the scale and the drift

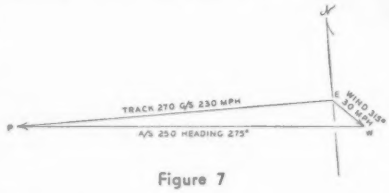

Figure 7

angle (5° L. in this case) read and applied to the track (270+5=275) for the heading.

A variation of this type provides a base plate beneath the ground speed grid.

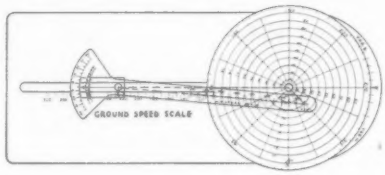

Figure 8

This takes the place of the air speed arm. It has two advantages over all others in that the heading may be read directly and the wind triangle is superimposed exactly as plotted. Inspection of Figures

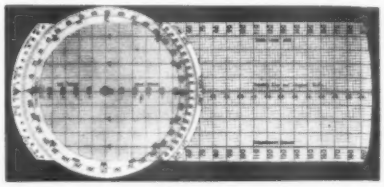

Figure 9

9 and 10 should reveal the reasons for these advantageous features.

Under present circumstances, a pilot will not go far (literally or figuratively) without a sound knowledge of the theory upon which all computers are con-

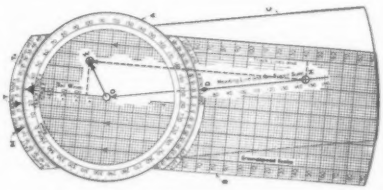

Figure 10

structed. A working familiarity with the various types of calculators is also required. Behind this lies the ability to visualize and interpret his problem in any of the accepted forms. After the flight has begun, it is too late to acquire such ability.

END

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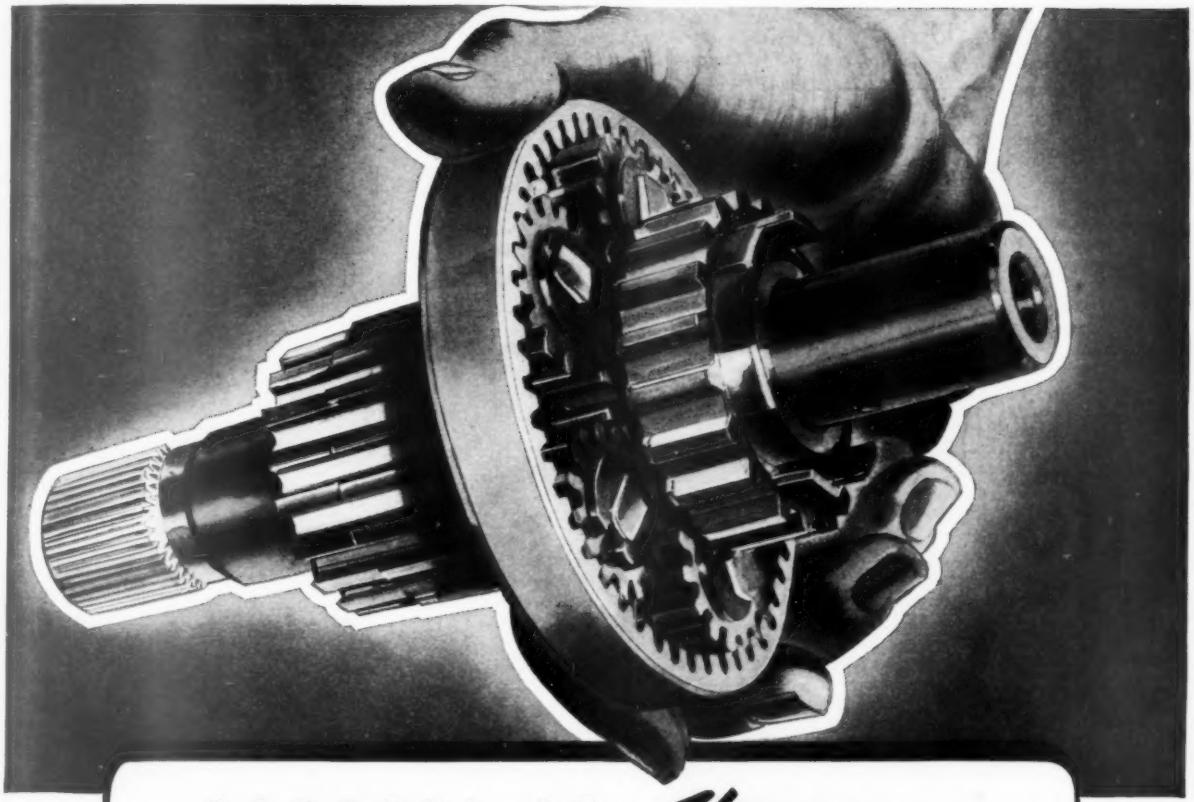
Sept. 13-14	Return flight to Spink-Wawasee Hotel, Lake Wawasee, Ind.*
Sept. 14	Hedgehoppers' Club Flight, Bristol, Va.*
Sept. 28	Breakfast Flight, Lost Nation Airport, Willoughby, O.*

CONVENTIONS

Sept. 17-19	National Petroleum Assn. meeting. Hotel Traymore, Atlantic City, N. J. (Aviation Fuels Section).
Oct. 2-4	Annual Convention of the National Association of State Aviation Officials, Providence, R. I.
Oct. 31-Nov. 1	SAE National Aircraft Production meeting. Biltmore Hotel, Los Angeles, Cal.
Oct. 31-Nov. 2	Aero Medical Assn. annual convention. Statler Hotel, Boston, Mass.

*AOPA flights.



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Want a Job?

(*Continued from page 50*)

every important executive job that comes up, with an eye to finding someone to fill it. If they're sold on you, they'll try to sell you.

Another, and probably better way, to go about finding a job of this kind is through personal contact with people in the industry. Canvass your business or professional associates and see if they haven't an idea or two about whom to see. Then get a personal letter of introduction to the man. In trying to get such a job, always remember to look over the industry first and pick out every possible spot in it that your experience would fit you to fill. Thus, if you were an accountant, go after accounting work.

The rules applying to an interview for this sort of work are about the same as they are for other, less highly-placed jobs. With, of course, this unfortunate difference: personality counts, right along with ability. A good mixer, who is thoroughly sure of himself and who gives off what sales managers like to call "an aura of quiet self-confidence," stands a much better chance than an equally able—or even more able—individual who happens to be overly shy by nature. Successful business men, doctors and lawyers have a tendency to be somewhat more aggressive than the average person.

* * *

We've had some inquiries from men who are pilots, and who wondered why they couldn't get training which would fit them as instructors, through the CAB training schools. The trouble is that most of them are missing qualifications, either on the basis of flying time, age, or physical condition.

All Government agencies—the Army, Navy, Marine Corps, included—have arbitrary regulations laid down for selecting personnel. Almost invariably, they will refuse to make exceptions to these regulations. If they say, for instance, that a man must have 180 hours and be under 31 years of age to take the CAA instructor's course, that means that if you are 31 years and three days old you are 32—and hence ineligible. And if you have 179 hours and 55 minutes, you haven't got 180 hours—and are still ineligible.

Exceptions, when made, are hard to secure. They come through an involved system of waivers. For instance, we know one man who has a sight deficiency which prevented him from getting a Commercial. He has plenty of flying time and has passed the theoretical and flight tests for an instructor's rating, even though he only has a private license. *Now* . . . if his eyesight had been sound when he started flying several years ago and had degenerated to its present state since then, the medical examiner could give him a waiver which would permit him to take his Commercial and get a job as an instructor. This is because his eyesight is still within the limits of what they call "normal degeneration." As it is, he can't get the waiver—even though his eyes are better than many pilots who have Commercials, but whose eyesight was normal when they first took their physicals.

The best thing we can tell you to do, if you are shy on pilot's certificate qualifications, is to try in some way to build yourself up to meet those qualifications. Sometimes the regulations conflict and a man who knows all the rules can occasionally find a way to reconcile them so that you can qualify quite properly. If you can, and you're thoroughly competent, he will help you do so.

* * *

J. W., Bethlehem, Pa. You should have no trouble with your qualifications in getting a job as an assembly mechanic at the Glenn L. Martin Company, Baltimore, Md.

Your question about "master mechanics" is a little harder to answer. There are many varieties of "master mechanics." Diemakers, machinists, patternmakers and many other types of men—such as senior precision and line mechanics and inspectors—are classed as master mechanics in the aircraft manufacturing industry. The tools which each is able to use may vary, according to the trade which each works at. But, in general, they will have certain features in common. All require an exceptionally sound knowledge of mathematics, including trigonometry, layout and lofting. Workers must be able competently to perform every mechanical operation in their respective lines. A master line mechanic or inspector thus would have to be capable practically of building the airplane and operating every mechanism in it. If he didn't, he wouldn't be able to get it ready for the pilot, or to assure the pilot that it was functioning properly. Many line mechanics, in fact, are pilots in their own rights. Although they may not be capable of flying heavy transport or military equipment alone, they can serve as flight engineers or copilots. They also have to have sufficient engineering knowledge to discuss shortcomings in the airplane with engineers.

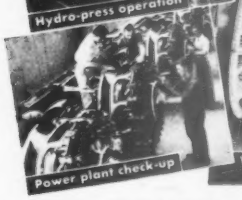
Master machinists and precision inspectors should know how to operate all types of machine tools and be skilled bench machinists as well. But that isn't all; some men can do these things without ever becoming "master mechanics." If you've ever seen a top-notch tool and die inspector measuring up a pattern on a surface plate, with half the engineers and assistant superintendents in the plant standing around watching him breathlessly, you'll get an idea of what he has to know and of the respect in which he's held. . . . Master mechanics don't seem to be entirely definable by the measure of knowledge and experience. There's a little touch of magic or genius about them that nobody ever seems exactly to be able to put his finger on. Some men—and they are rare indeed—seem to have a pride of workmanship, an instinct, a carefulness and a knack for doing difficult things perfectly and without fuss, that sets them apart from their fellows. The other men may make competent craftsmen, but these chosen few make master mechanics.

END

Aviation Executives Say . . .

We Can't Get Enough Men for the *More Important* Production Jobs

Hydro-press operation



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Wing assembly inspection

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It's precision that counts in the air. You always can count on Kollsman for Precision!

We Must Learn . . .

(*Continued from page 23*)

manders who had no more than a bowing acquaintance with arms other than their own; who thought largely in terms of cavalry, artillery, bombers or submarines and were inclined to professional jealousy of each other.

In 1935, some 30 or more officers of proven capacity were transferred from the German army into the *Luftwaffe*, it is reported, with Adolf Hitler's approval despite some internal professional grumbling. They were taught to fly all types of planes and grappled with the problems of bombing, parachute attack and moving large bodies of troops by air transport. Three years later the same group was shifted into the navy to study tactics of sea warfare at first hand.

They are key generals now—and others are undergoing the same fitting process to fill commands in a fighting team which has overrun Europe and now has the rest of the world at bay.

The results of this scheme of coordination first appeared in the conquest of Poland, where ground and air forces fought as an invincible team. The invasion of Norway brought the third dimension—the navy—into action with the other two elements of striking force, in a dramatization of perfect timing such as never before had been seen.

The quick conquest of the Low Countries and France, the invasion of the Balkans, the aerial capture of Crete and, most recently, the onslaught on Russia, have piled up further frightful evidence of the effectiveness of officers schooled and experienced in unified command.

Meanwhile, in this country, one is made uneasy by the tart testimony of such veterans as Maj. Gen. Johnson Hagood, Ret., who complained that "the best trained man in the American Army is the private soldier and the worst trained is the general." Only now has the War Department been able to tackle the vital but unpleasant task of weeding out officers.

There is no intention to assert here that the Nazi lesson has been completely lost on the War and Navy Departments. But in the existing state of urgency, American measures to achieve such vital coordination of all arms appear timid indeed, even though the Army particularly has not been loath to borrow other German ideas.

Army officers at the Command and General Staff School and in the specialized training schools of the various branches of the service, devote study to the "combined arms." There have been efforts along the same line in the Air Forces. A relative handful of Army officers have attended the Naval War College in past years and some sea officers have been admitted to the Army War College. A few Navy and Marine officers too are enrolled in the Army Industrial College, to learn methods of mobilizing industry for the production of munitions.

There is a measure of coordination of Army and Navy affairs through the Joint Board. Gen. George C. Marshall, chief of staff, said this agency now is in almost continuous operation through its expert committees, whereas until recently it held sessions only about every six weeks.

In the hard school of experience, under difficulties attending the mushroom growth of the defense establishment, a Marine Corps general has been widening his outlook as commander of the first amphibious joint Army-Navy task force to be formed on the east coast. In Newfoundland the Army upset tradition by putting Col. Henry W. Harms of the Air Forces in command of land troops as well as aerial forces and another veteran flyer, Maj. Gen. Frank M. Andrews, was chosen to head up all defenses of Panama.

But there has been no sign of a move toward such an interchange of able officers such as Germany has carried out with significant advantage. If the exchange arrangement were advisable for Nazi Germany, whose war operations have been confined largely to the European continent, its prompt adoption would appear nothing less than imperative for the United States. We are building a two-ocean Navy, a formidable Army, an Air Force which may ultimately be the world's most powerful, with the proclaimed intention of safeguarding the entire western hemisphere and, in conjunction with Great Britain, sweeping both the Atlantic and Pacific of enemies.

Directing the vast operations of the combined German land, air and naval forces, it should be noted, is the great general staff, which was revived after its enforced abolition following the first World War. Eventually, in the inevitable general overhauling of our own defense establishment, the creation of such an American high command will come.

Just now in the midst of the hurried national effort to build up all defenses, it might be contended that a sweeping reorganization would be confusing and demoralizing and cause delays which can not be risked. No such contention would hold against the creation of a General War College as a training school for the high-ranking officers of all three branches. It would be even less valid against a simple interchange of officers.

Out of a corps of more than 100,000 officers on active duty, the War Department certainly can spare 250 or so for service of a year with the Navy, to be preceded or followed by duty with the Air Forces. A like number from the Navy should be given the same opportunities for training in all phases of defense teamwork, along with a similar group of Air Force flyers of command caliber.

This is the logical and simple means to provide the commanders for the combined air, sea and land operations which hemisphere defense demands and to create as well the nucleus for an eventual American supreme general staff. Both objectives call for action without delay.

END

In the Air On the Ground...

Edward Litizette, United Airlines radio operator stationed at Omaha, Nebraska, transmitting and receiving reports from planes en route by the use of Kellogg equipment.

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Edward M. Carney, left, and H. P. Morgan, right, at United Airlines' Chicago radio station depend on Kellogg equipment to keep in constant two-way communication with their planes.

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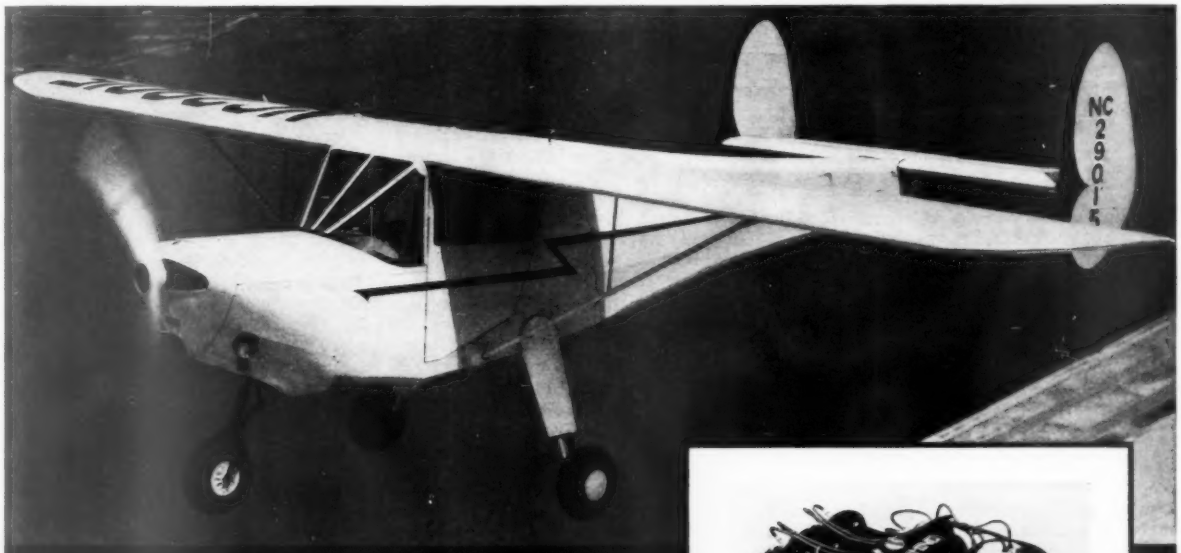

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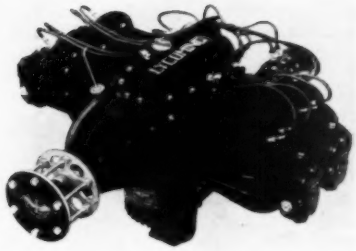

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Float Factory

(*Continued from page 20*)

by immersion in a "salt pot" containing 4,500 pounds of nitrate salts kept at a constant temperature of about 950°, then quenched in cold water. Rivets, made soft by heat treatment, are kept on dry ice until ready for use; they harden only after exposure to normal temperature for 15 minutes to half an hour.

The first step in making a float starts within 20 minutes after the largest duralumin section is taken from the heat treatment. It is rolled to provide the float's flat top expanse and sloping sides. Simultaneously, sheet alclad bottom and bulkhead members are being cut and drilled, gusset plates blanked out in press dies and other parts cut and shaped. The finished standardized parts are stored away until called for by the assembly workers.

On the assembly line, the frame parts first are laid out on a master frame jig. Each is dropped into place in a cast iron form recessed to receive them. The chine ends of the frame angle are cut and the sheet portions of the bulkheads placed in position. This preliminary framework is riveted, then placed in an inverted position on a steel erection jig. Here lever-operated cams accurately locate each frame and bulkhead in its proper position, after which the longitudinal stringers are riveted into place.

The curved bow stringers are installed next and the skeleton assembly is ready for bottom covering. The unique scalloped bottom in the middle portion of the float is installed first. Then comes the rear bottom sheet, the front bottom bow sheets, the keel and the side spray strips. All of these have been turned out previously in the detail department.

Next, the float is turned over and placed in a cradle jig shaped to fit its bottom. Bow side sheets, middle rear side sheets and chines are put in and riveted. The float then is ready for the anodic oxidation treatment. This is an Edo specialty—a method of protecting aluminum alloys by forming a thin film of aluminum oxide on the surface. The float is lowered into a chromic acid bath and connected to the positive lead of a direct current supply. The negative end is attached to the steel tank. About three volts of electricity are applied to begin with and the voltage is stepped up slowly to about 40. It is maintained there for 30 minutes. Then the float is removed and the chromic acid—which has had no chemical reaction upon the metal, simply serving as a current conductor—is washed away.

The float next is tested for leakage by filling alternate sections with water. Its inside is given a coat of corrosion preventive. Finally it goes back to the cradle erection jig for installation of deck sheets, which already have been given the oxidation treatment. The strut attachment plates and the steel nose-ring are installed and the standardized float is ready for final exterior spray painting.

Since Earl Dodge Osborn perfected this process and began to turn out floats commercially, many record-breaking flights have been made by seaplanes. Col. Charles Lindbergh and his wife made their 41,000-mile voyage of exploration west to the Orient, touching four continents, in a Lockheed *Sirius* with especially-designed floats, each of which carried 150 gallons of gasoline. The second Byrd Antarctic expedition found its float-equipped *Condor* just the thing for flying over the South Pole's icy wastes, as did Lincoln Ellsworth, who used a Northrop seaplane on his transantarctic flight.

Today, in such widely-separated points as Alaska and Borneo, Chile and Norway, Australia and Hawaii, Edo-equipped planes have proved their versatility and general usefulness. In out-of-the-way, hard-to-reach places they are blazing new trails constantly. Far up the yellow rivers of China, deep in the tropic jungles of Africa, back near the source of India's thin, muddy streams, they are venturing into regions never before accessible to man. One world traveler recently covered 35 countries on a casual 29,000-mile trip in a float-equipped Bellanca—a feat which no landplane could have duplicated without considerable advance preparation involving the leveling off of landing areas in many places where none now exist.

In America the seaplane is proving its usefulness to private flyers. In cities like New York, Chicago, Cleveland and Philadelphia there are bases in the business districts, enabling seaplane owners to commute between home and office. In many sections, sportsmen fly seaplanes deep into the woods for long week-ends of hunting and fishing. At waterfront vacation resorts, float-equipped aircraft carry thousands each year on sightseeing hops and charter flights. In the mountain areas such ships are used extensively, both for cargo transportation and for training, with every lake a level landing field.

The Navy is stocking up on lightweight, speedy, easily maneuverable seaplanes as an important part of its preparations to defend the Nation. Edo now is turning out floats in quantities for the Curtiss-Wright SO3C-1 and OS2U-2, both single-float catapult planes used for observation and scouting; and for the Vought-Sikorsky SB2U-3, a twin-floated dive bomber. These floats generally are of the same construction as those for commercial use. They have passed the Navy's drastic rough-water tests, have been proved capable of carrying large quantities of gasoline without leaking and have shown themselves able to stand the stresses of a battleship's catapult shot.

The big news about aircraft flotation equipment today is its rather belated "discovery" by aviation's owner-flyers. For them pontoons spell added safety, increased range and—frequently most important of all—freedom from landing-field congestion and excessive landing charges.

END

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New Fueling System

"SUPER-SERVICE" for aircraft is the goal of a new, self-contained system for fueling planes which has been put on the market by S. F. Bowser & Company, Fort Wayne, Ind. Called "Serv-A-Plane," the unit has 100 feet of hose, fuel-measuring meter, and many other features. It is powered with an explosion-proof electric motor. Storage space is provided for canned lubricating oil, windshield cleaning equipment, and other accessories. With it, the manufacturers report, airports can speed fueling.

From the Ground Up

AN air show "batman" with a record of 389 parachute jumps, William H. Cook, Los Angeles, recently joined the Air Corps. Assigned to Randolph Field, Tex., he was for the first time taught to pack a 'chute.

Become A KEY MAN in the Aviation Industry

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NOT AN APPRENTICE COURSE . . . but preparation for a lifetime career as a highly paid specialist in aircraft construction and production. Most Complete One Year, Practical, Intensified Course of its kind—you Actually Learn By Doing.

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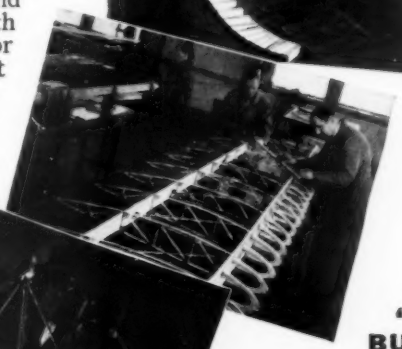

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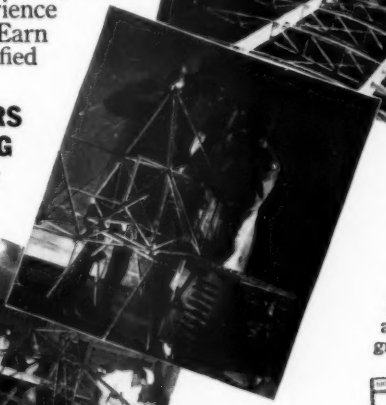

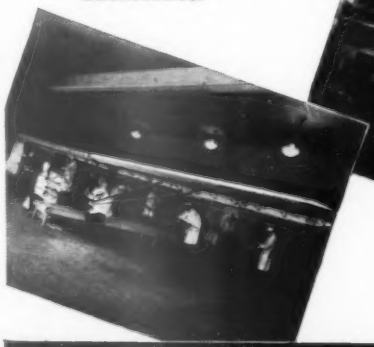

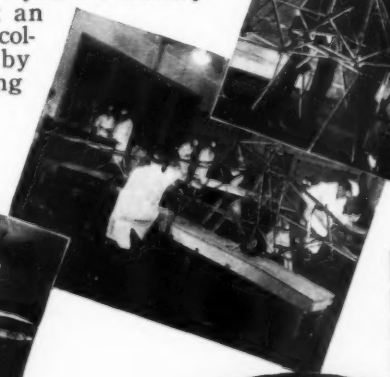

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Flying Rancher

(*Continued from page 32*)

is at the old Z Bar T stand, while the Pitchfork, Wyo., postoffice is at the original site.

Belden is Pitchfork's postmaster. It's his ranch and the office is used exclusively by his people. As a matter of fact, the post office is wherever Belden happens to park the cancelation stamp, usually in the left hip pocket of his trousers. Gather 'round now and hear the tale of the philatelic covers, the Pitchfork pack rat and the Belden sense of humor. . . .

"Cover" collectors—those otherwise normal men and women who write letters to themselves and then carefully preserve the envelopes in which they come back—long have valued Pitchfork cancelations from the only "private" post office in the country. One day a packet came to Belden just as he was taking off for one of the outlying camps. Would he please cancel and mail them back? He stuffed the envelopes in the accustomed hip pocket, along with the rubber stamp, for attention later.

That night a pack rat gnawed away some of the lettering on the one and only cancelation stamp. In the morning Belden discover the mishap. With simple directness he caught the rat, canceled the covers first with the mutilated stamp, then filled in the empty spaces with inked impressions of the rat's snout —and mailed the letters.

Came pained, indignant protests from the collectors. Patiently and gravely Belden answered each with a note of explanation. Those covers, each with its note describing the pack rat incident, of course are now real collectors' items.

The rancher—pilot, photographer and king of a vast domain though he may be —is proudest of the fact that he is the oldest Republican postmaster in point of service in all Wyoming. At 53, he rounded out 25 years in office last December. Some years ago he met the then Postmaster General James A Farley in a Washington hotel. During their conversation Belden laughingly told Farley that Pitchfork was one post office still safely in Republican hands. Somehow word of the meeting got to a Washington newspaper man. "Republican Postmaster Defies Farley," was the headlined result!

As a matter of interest, Belden's visit to Washington was on postal business; a ruling by his superiors that postmasters in his class must spend four hours a day, no less, on the job. Representing Uncle Sam's mail service in Pitchfork just isn't a four-hour-a-day task, he contends.

Belden is seldom seen without the camera he has carried for 25 years, throughout this country and Europe, and which has done more to acquaint the world with the rugged beauties of Wyoming than any other medium. Belden believes he has carried the camera nearly 60,000 miles on horseback and well over 100,000 miles by air. Camera and art magazines, travel publications, the National Geographic Magazine, newspaper rotogravure sections and illustrated weeklies throughout the world have carried Belden "spreads" on Wyoming ranch life.

When Life began its meteoric rise as a picture magazine, among its first "photo histories" was one on cattle ranching—by Charles J. Belden, rancher. Best of the pictures used is still Belden's favorite. He calls it "The Whip"; it shows a long line of cattle winding their way over snow covered terrain in single file. The background is dead white. One can almost feel the cold, the misery of the cattle, the loneliness of the storm swept land. Belden disclaims personal credit for the shot. Nature framed the scene; he merely recorded it.

Pitchfork is the largest ranch in the United States which accepts dudes; it takes only 20 of them at a time. Guest cabins and ranch buildings are on Timber Creek, a tributary of the Greybull River; and at the foot of Franc's Peak, which towers 13,000 feet above sea level. The ranch airport's altitude is 7,000 feet.

Spring hunts for grizzly, brown and black bear are organized between May 1 and July 1. During the fall guests may bag bear, elk, deer, mountain sheep, moose and antelope. Charlie and Mrs. Belden are host and hostess to their guests, but they leave the running of the dude ranch to one of their two daughters. Foreman and boss dude wrangler is a Wyoming native, Joe Bodan. He and Mrs. Bodan have charge of ranch routine.

"We can accommodate only 20 dudes," Belden wrote recently, "but we have 200,000 acres, which is 10,000 acres per dude if they want to 'get away from it all.'

"Last year Wally Beery flew here in his Howard from Hollywood, landing on our airport, and within two hours after we started out with him on an antelope hunt, he and his party had bagged four nice bucks.

"Other aviators who have been out for the hunting and fishing during the past few months include Tom Wolfe, Western Air Lines; Croil Hunter, president of Northwest Airlines; Ruth Nichols; Justin Dart; Alice Rogers Hager of the CAA; and Ralph Carter, old time pilot and manager of the Town House in Los Angeles.

"More planes have landed on Pitchfork Ranch than any other dude ranch in the country and our landing field is safe for any type of ship up to and including a Douglas DC-3."

Belden is a cowman, you'll agree, who knows what an airplane is for . . . but custom makes him bring the dudes from the airport to the ranch in a rickety old stage coach!

END

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OLDEST AMERICAN SCHOOL LARGEST
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Airline instrument maintenance departments are growing bigger and bigger . . . aircraft plants can't find enough men trained in instrument installation . . instrument makers are in urgent need of trained personnel. Also hundreds of Civil Service positions open at Army and Navy aircraft maintenance depots—permanent civilian jobs at good pay from the start. Only 6 months training at this school serves as your COMPLETE substitution for the 2 years' actual instrument experience usually required to get these good jobs.

Train to be an instrument technician and become a man urgently needed NOW . . . a man who can make an important personal contribution to national defense . . . and at the same time have a fascinating, profitable line of work and a secure, successful future. Here is an unusual opportunity . . . even for a field so rich in opportunity as Aviation.

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Teletype Vocabulary

NEARLY 3,000,000 words per month pass through TWA's Dayton, O., teletype center, reports Howard K. Morgan, communications superintendent. Interdepartment, operations, and reservations messages alone require more than 2,100 miles of specially-leased wire. Average time of messages in clearing from station to station through Dayton is only 1½ minutes.

Flying to Nowhere

LONG "flights" in stationary ships give blind flying practice to Pan American and Pan American-Grace Airways pilots. For four hours monthly each must sit in a trainer's hooded cockpit and handle the controls exactly as if piloting it over a course outlined by radio by an instructor. Flight conditions of all types are simulated and special instruments automatically record the pilot's actions. Indoor "airports" where these tests are taken are located at Miami, Barranquilla, Lima and Rio.

He Stands for SAFETY *and* FREEDOM

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DEFENSE SAVINGS BONDS and STAMPS

Think, too, how YOU can help.

Let the Minute Man remind you to do your part.

Save and buy Defense Savings Bonds.

They will help protect your homes and your families today.

They will help make the future secure.

This Message Is Published by Us in the Interest of National Defense

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Publishers of FLYING AND POPULAR AVIATION • POPULAR PHOTOGRAPHY • RADIO NEWS

Aerodynamics Condensed

(*Continued from page 55*)

Oversized surfaces give the airplane a dampened oscillation about its three axes if the direction of the air stream is changed suddenly (Section 8).

Function of the rudder and stabilizer is easily understood. The effect of the dihedral for lateral stability is indicated in the sketches in Section 9. By inclining a plane laterally, the resultant air forces and weight make it slip sideways. This side movement of the plane gives the lower wing a greater angle of attack that returns the plane to level position if rudder dimensions are correct. Dihedral and rudder usually coordinate in their functions. Too small a rudder causes a "dutch roll." If the rudder is too large the plane will tend to spiral. Negative dihedral (droop) is called cathedral.

The unit that moves a plane forward is the propeller, or the propeller thrust. Thrust exerted by the propeller must be equal to the sum of all drag forces. A propeller is an airfoil rotating about an axis. Lift forces constitute the thrust. Resulting drag must be overcome by the engine torque as indicated in Section 11. Two characteristics of a propeller are indicative of its use on a design; its diameter and pitch. The geometric or nominal pitch is advance per turn if the blade would slide on its flat working side sketched in Section 12. The actual advance per turn in flight is effective pitch. The ratio of the pitch and the diameter is decisive of the maximum efficiency obtainable. The average maximum efficiency is plotted in a diagram in Section 12.

The drag of a wing may be divided into induced drag or theoretical drag resulting from the downward forcing of the air stream and profile drag, created by friction on the surface and the force required to part the air. Thinner sections and smaller wings have less resistance. More slender fuselages are also raising the airplanes' efficiency.

The aspect ratio does not influence the profile drag; the induced drag will be higher and the gliding angle steeper with a lower aspect ratio. The structural weight will be lower for low aspect ratio wings than for high aspect ratio wings of equal area.

Another influencing factor on the airfoil drag is the airspeed and the chord length. This function is called the scale effect. The friction of the air is caused by adherence to the surface over which it passes. This is called the boundary layer. The higher the speed the thinner the layer. At high speeds the layer is about 1/1000 of an inch thick; therefore, surfaces should be made as smooth as possible.

The airplane must travel at a certain speed for each angle of attack to lift a certain weight. The minimum speed possible is the stalling or landing speed. Flying at level speed and increasing the angle of attack (by control or otherwise) the machine will climb, and decreasing the angle the plane will decline within certain limits. Each flight level requires a certain power as plotted in the diagram, Section 13. At a certain speed the power required is at its minimum and a maximum duration is obtainable. The difference between the available propeller horsepower and the minimum power required, indicates the power, which could be used to make the plane climb. The greatest distance is obtained at a slightly higher speed, using the best gliding angle.

The ratio of maximum power and minimum power required indicates the absolute ceiling. The ceiling where climb drops to 100 feet per minute is the service ceiling.

The vertical component of a gliding airplane is the sinking speed, which is in direct prportion to the minimum power required if the glide is not too steep.

The lower sketch in Section 13 shows the location of the landing gear relative to the center of balance.

A wing and fuselage combination must be so arranged that the air flow around them should have a minimum of interference as in Section 14. Tapered wings are more efficient but with square bodies straight wings give best all around performances.

In a level, circling flight the resultant must be increased by increasing the angle of attack or the speed in order that the lift component of the resultant should be equal to the weight. The other component C must be equal to the centrifugal force as shown in Section 15. This increased resultant is used in stress calculation; to this the 50 per cent safety factor is usually added.

Improvement in speed has been accomplished by using flaps, which reduce the landing speed by deflecting additional air downward as shown in Section 15.

Aerodynamics may be considered to be at its best if the air is deflected with the least amount of turbulency past a wing, fuselage, tail, flaps or propeller, for turbulence is wasted energy.

END

Low-Cost Flying

IF you can afford to spend $1 a day you can afford to take up flying. This sum will give you 100 hours in the air per year in a co-operatively owned plane and will cover insurance, hangar rent, operations expense and maintenance. So states the Aeronca Institute, Middletown, O., lightplane research foundation, following a study of the six-man flying club recently organized in New Haven, Conn. After examining this club's financing and operating plans the Institute commended the New Haven organization and recommended that its set-up be studied by groups planning to form flying clubs.

Salient features of the New Haven club are: the members' ages range is from 20 to 39. Three already have private licenses. All fly purely for pleasure, although at least two have an eye on possible Army service. When they formed the club, each member put up $130 in cash. They then borrowed $1,200 from a bank on their joint note. This gave them enough money to buy a new Aeronca *Super Chief*, a 65 h.p., two passenger side-by-side lightplane with a cruising speed of 100 m.p.h.

The club members pay $9 a month dues, which take care of hangar rent, insurance and interest on the loan. The insurance covers all sorts of accidents, plane damage and passenger liability. Flying costs are assessed at $2.50 per hour, which is calculated to defray actual operation expenses and leave a profit of about 75 cents an hour. From this profit, the club expects to retire the bank loan over a three-year period.

Each member must take at least nine hours flying time each three months. Instruction is obtained from the staff at the local airport and is paid for individually by members desiring it.

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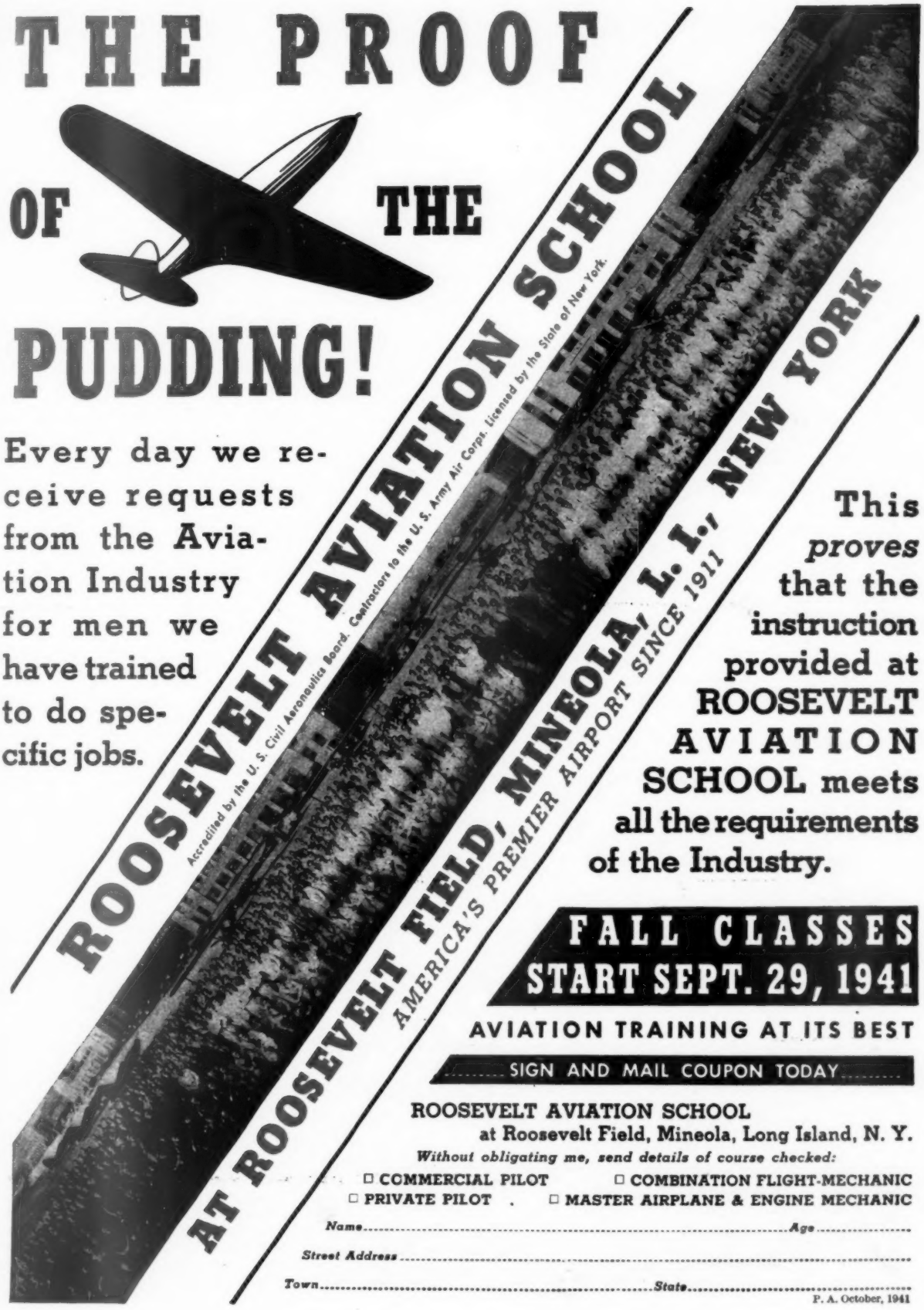

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P. A. October, 1941

Pilots Are Superstitious

(*Continued from page 26*)

have to fly over the jagged domain of the glacier gods.

Other flying superstitions range from the time of day to the color of a flying scarf. Some are traceable, some are not. The taboo against borrowing or lending flying helmets is common and probably grew out of the fondness which every student has for the helmet in which he negotiated his first solo flight. But however it started, today, in many fighting squadrons, it is unwritten law that the subject of borrowing helmets shall not even be mentioned.

Capt. Bob Galloway of the U.S. Marines refuses to fly without his own goggles. He will not lend them. If someone uses them without permission, he throws them away and buys a new pair—at a cost of $20.

Dick Grace, the movie stunt pilot, used to arrange the deliberate crashes which looked so accidental when you later saw them in the film thrillers, to take place at exactly 11:45 a.m. That was the lucky hour and minute when Dick "got out of things."

Ken Behr, manager of New York's Floyd Bennett Field, does not like to climb in the right side of an airplane. If there is no left entrance, he removes the curse—he hopes—by crossing his fingers. So many pilots share his feelings that the right-door jinx probably takes rank as the outstanding flying superstition. Tracing that one is easy: early military pilots were transferred from the cavalry and a soldier always mounts his horse from the left.

Geography has played its part. Pilots who pioneered flying in the West Indies frequently refuse to drink rum from a glass. They swig from the bottle, or drink something else. Practically all extropical pilots observe a ritual when putting on their shoes. They first turn them upside down, then tap them together. Since tarantulas and scorpions sometimes crawl into boots and shoes, the practice started as necessity. Brought north as habit, it grew into a full-fledged superstition.

Phil Kelly, veteran American pilot, traces one widespread and continuing bugaboo to the Regular Army sergeant in charge of his cadet barracks. One morning the sergeant yanked the blankets off a student pilot who was slow in getting up for reveille. Later in the day the student was killed. The next time the sergeant tried the stunt, he was mobbed. Kelly and a lot of others have refused to let anyone touch their bedclothes ever since.

Black and green are the bad-luck colors. In the last war, coal-black airplanes were called coffin-crates. European pilots—women especially—object to taking off in a green airplane or wearing any article of green clothing while flying. One continental aviatrix states her aversion this way:

"Green is the color of crashes," she shudders. "The trees are green. The grass is green. Pilots always die surrounded by green."

Some flying superstitions are dying, however, and at least one has been forcibly squelched. Four hundred m.p.h. airplanes are tough on the boys who consider it bad luck to clean their goggles just before a take-off. In the old days, if they failed to wipe off the smudge on landing, they peered through it until after the next flight—but no more! Even before the end of the last war, the necessity of grinding out students triumphed over the belief that it was fatal to fly while the flag was at half-mast: in other words, until the last man killed was buried. Since someone around the big training centers was always dead and unburied, the harassed instructors simply had to make each new death a signal to shoo all flying cadets into the air before they lost their nerve.

Some aviators, of course, are not superstitious. Eric Wood and Frank Ambrose, both well-known American pilots, say the best good-luck formula they know about is eternal vigilance. Jerry Jordanoff, author of flying text books, adds that a military pilot cannot afford to be superstitious.

"If he is," says Jordanoff, "some fine day he gets upstairs to discover he has left his pet gollywog or what-not behind. There goes all his confidence; here comes an enemy plane—and poof! Next day we bury him."

So maybe there is nothing in it. After 23 years of flying, including one major war and several assorted revolutions, this writer does not know. But he does have an old-time dictionary which says that the word superstition comes from the Latin *supersto* and means that which unaccountably survives when its companions are dead.

So as a veteran *supersto*, I think I'll continue to spit an the tail of a new airplane before I fly it. Just in case.

END

Gas Savers

SINCE United Air Lines installed fuel injection carburetors on its DC-3's, the line's statisticians have been recording the carburetors' money-saving qualities. Present data indicate that fuel injection saves approximately 10 per cent of the gasoline ordinarily used. United set up an example this way: assuming that 600 gallons of gasoline are in a DC-3's tanks for a Chicago-New York flight with the standard type of carburetor, 60 gallons less would be required with fuel injection. Saving the weight of 60 gallons (360 pounds) enables the plane to carry two additional passengers ($89.90 for two one-way tickets or $161.80 for two round-trips). On the Chicago-New York flight there would be a saving of approximately $100 in gasoline. Adding these potential gains because of fuel saved, a typical coast-to-coast flight would save the airline approximately $325.

Winter Precautions

DON'T leave any openings in the bottom of your ship's fuselage when winter arrives, Aero Insurance underwriters advise. They cite one case where 30 pounds of snow and ice accumulated in a plane's tail through its tail wheel assembly opening.

Other winter warnings from the underwriters are: Make sure your brakes aren't frozen on or off. Remember that gasoline expands with heat, and make allowance for it when refueling if you're going to move the ship into a warm hangar. Keep your battery fully charged; otherwise it may freeze and crack.

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We Pilots Want Service!

(*Continued from page 22*)

To wind it up, I took my problem to Stan Dearing at Pacific Airmotive, explained it and left the plane. The next day I got it, belly repainted, brakes fixed, plungers lined up and I never had any further trouble. PAC does not specialize in that or any other type of airplane. That organization just knows how to do things.

Dealers and distributors, for some unknown reason—perhaps it is because so few models of each airplane are sold—don't stock parts. I have sent back to the factory for a Phillips belly cowling screw; to an auto supply company for an inferior replacement of flexible intake manifold; to the factory for windshield weather-stripping; and have waited days and even weeks for replacements. If we are to have a big private aviation business, dealers and distributors must start stocking these and other small items which past experience indicates will fail sooner or later. There is nothing more depressing than to watch a dealer or distributor "fix something up just as good" until replacements arrive.

Dealers and distributors must guarantee, not their equipment, but their service facilities. Talk to any automobile dealer and he will tell you that more than half the job of selling automobiles is to be able to sell service. The dealer who makes money is the one who sends his mechanics to school to learn all the details of each new model; who has a clean repair shop in which mechanics function efficiently; and who is able to make repairs at a reasonable figure.

The responsibility of service in aviation is one which must be accepted, even more than it is in the automotive field. If a motor quits as the result of faulty automotive repair, the car coasts to the side of the road. In flying, that doesn't hold true.

The smart manufacturer, today, will sell his plane to women. The field operator will sell his field to women. Everything must be slanted that way. That is the only way we'll stop the standard remark:

"He used to fly a lot, but he got married and his wife doesn't like it."

Everybody has to pitch in and *make* her like it.

I have only one more suggestion to make—and again I've borrowed from the automotive industry. I believe that the smartest thing a lightplane manufacturer could do would be to run tests in the west's high, dry air. He'd be amazed at the performance he doesn't get at noon in July in the middle of Arizona, let us say. Amazing things happen in our up drafts, down drafts, heat and other meteorological phenomena. And ships actually depreciate differently, with unexpected things wearing out.

We have war and a national emergency and the present onerous "don't fly more than 3,500 feet above the terrain unless you have two way radio." Maybe such regulations have to be. Why, in contact flight, along airways, I don't know. But I'm conforming to it because (a) I can't afford a two-way radio right now and (b) I don't want to go through the red tape and the added weight that it means. So I'll not beef about CAA regulations. Except for this last one, I love them. If there were no violations we'd have 90 per cent less accidents, according to those who go into statistics, and that's enough evidence for me. I automatically tip my hat when I pass an inspector. He and the CAA are making aviation safe and encouraging it in exact proportions.

I think I've made my attitude clear, but let me say frankly that I'm not slapping anybody's wrist or venting any personal animus in writing this article. I'm trying to be constructive. I'm trying to point out, as one of those guys who gets around in an airplane, that if private flying is going to go places after the war, there are a lot of jobs to be started and done right now.

I love to fly. I take pride in owning my own plane. I have enough of the pioneer in me to accept today's hardships and handicaps for what they are. But I wonder if the post-war lads won't give up the private flying game pretty quickly when they can't be properly serviced with oil and gas; when fields have no facilities whatsoever; when they have to sleep under wings because they can't get to towns; and when they have to walk five miles to the nearest gasoline or telephone.

And when I complain, I'm certainly not beefing at Chattin's white-coated, thorough service at El Paso; the job Hangar Six does at San Antonio; the service at Wayne County Airport, Detroit; and many other fine spots. These lads have the right idea. The point is that others have to fall into line. Not for my personal comfort. But for the thousands who, if aviation is to prosper, are to come to a thousand airports.

END

Model Makers

IF World War II were being fought in miniature by model builders, President Roosevelt's demand for 50,000 airplanes annually could be met by the Comet Model Airplane & Supply Company alone 200 times and more. The firm shipped out approximately 10,000,000 model sets during 1940. Founded by two high school boys in 1929 on a capitalization of $5 and a working knowledge of model construction acquired at Chicago's Crane Technical High School, the Comet Company now employs several hundred people. Its Chicago factory occupies 70,000 square feet of space. Comet produces 90 per cent of U.S. model propellers.

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RADIO NEWS

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Nazi Radios

(*Continued from page 42*)

can communicate with the base.

4. The Messerschmitt's apparatus cannot pass U. S. Government tests for even commercial radio equipment. It also weighs more than comparable American apparatus.

"Radio equipment from the Messerschmitt is intended primarily for communication over very limited ranges," Lear commented. "The equipment is comprised of a low-power transmitter sufficient for interplane communication, a receiver and a power supply unit. The receiver is relatively insensitive and the transmitter output is so limited that it cannot be picked up by the enemy at a distant location. The frequency range is from 2,500 to 3,700 kc., which in itself represents a very narrow band for communication purposes. Both the receiver and the transmitter are tunable in this range of frequencies.

"The equipment weighs in the neighborhood of 60 pounds. Approximate dimensions for the various units are:

Receiver—
13¼"x9⅞"x6⅞" high .....13 lb.
Transmitter—
8¼"x13½"x7½" high .....20 lb.
Dynamotor and filter—
9½"x4¾"x9" high .....13 lb.
Junction box and cables—
4⅝"x9¼"x3⅛" high .....13 lb.
Resistance units—
4½"x5¼"x2" high ..... 2 lb.

"Commercial equipment may be obtained in this country which will give much better performance and yet be considerably lighter and take up much less space. We have progressed further with the development of lightweight aircraft equipment in commercial fields than the Germans have with their military equipment.

"In general, the equipment is very ruggedly built. The chassis of both the transmitter and the receiver are lightweight castings. The material used is Elektron, a special aluminum alloy having a high percentage of magnesium, yet which will not burn when subjected to intense heat. The castings and the rest of the equipment was painted a dark gray, the standard color that is to be found on all German military equipment.

"The various units are interconnected with cables, which are complete with coupling plugs. These plugs are waterproof and include a ceramic terminal board for the various connections. The practice in this country is to provide cable connectors at the receiver or transmitter proper, thus eliminating the disadvantage of having a piece of cable attached to the equipment permanently.

Shielded rubber covered cables are used in this country for maximum dependability under humidity and abrasion, whereas German equipment uses fiber-covered cables.

"The German workmanship is very good. However, the equipment as a whole will not meet the requirements which we impose even on our commercial equipment.

"It will not pass our test with respect to operation over a temperature range from 40° below zero to 150° above zero F.; nor would it pass our humidity test, since the various metallic surfaces are not protected against corrosion. None of the coils are impregnated with a protective coating of wax, so it is doubtful whether the equipment even would operate after being subjected to humidity test.

"As far as the various features mentioned above are concerned, this equipment is at least seven years behind our commercial practices. The Germans 'froze' this design a good many years ago and have concentrated on making a large number of these units available for application in the Messerschmitt Me-109's.

The general use of die casting and the method of construction employed are indicative of large quantity production. This same general type of construction is used in some of the Germans' later designs. The same plugs and sub-assemblies are used in various applications, indicating the tendency to standardize for mass production."

END

A Gift of Song

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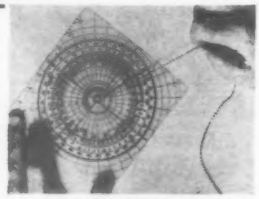

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Bergen Contest

(*Continued from page 28*)

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Others receiving honorable mention included: Stuart Weldon, 113 G.N. San Vicente Blvd., Beverly Hills, Cal.; John W. Rice, 715 Mt. View, Monrovia, Cal.; Lloyd Van Hove, R. R. 2, Box 1, Carthage, Ill.; L. E. Randle, care of KMED, Medford, Ore.; Pvt. Henry W. Kent, Scott Field, Ill.; Nancy Jane Miller, 715 S. Serrano Ave., Los Angeles, Cal.; Aileen McHenry, Beloit, Kan.; H. D. Hoover, 213 N. Third St., Leesburg, Fla.; Dr. Edgar S. Bacon, 515 Madison Ave., N. Y. C.; George D. Wheeler, 3849 Harrison St., Oakland, Cal.

Charles Kannenberg, 2337 S. Burrell St., Milwaukee, Wis.; W. J. Gallagher, First Squadron, R.C.A.F., St. Thomas, Ont., Can.; Harry C. Copeland, Syracuse Airport, Syracuse, N. Y.; Richard H. Dwyer, 57 Pleasant St., Marlboro, Mass.; Ralph Haskins, 311 Foche Blvd., Mineola, L. I., N. Y.; Harry Morrow, 377½ Franklin Ave., Aliquippa, Pa.; John M. Domaratius, 1709 Summerfield Ave., Brooklyn, N. Y.

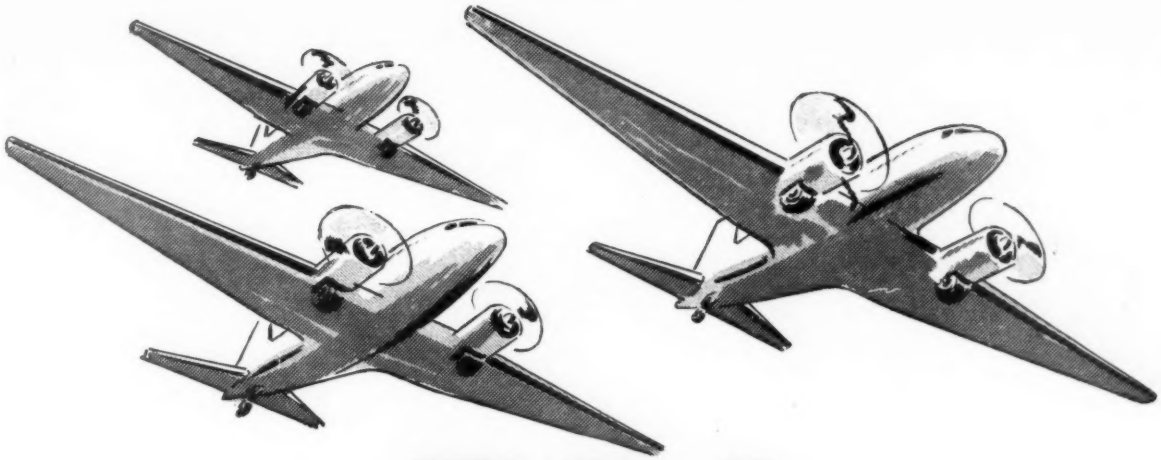
Bert Sechrist, Boeing Field, Seattle, Wash.; L. C. Harper, 113 W. Queen Lane, Philadelphia, Pa.; Elmer R. Luense, Box 106, Walterboro, S. C.; Dr. Nestor G. DeQuevedo, Factoryville, Pa.; Henry E. Cook, Chula, Mo.; Norman Gatling, 626 N. College Ave., Bloomington, Ind.; E. Richards, 1250 Brookmere Rd., Pasadena, Cal.; Sgt. John C. Morrow, Box 102, Rantoul, Ill.; Reg L. Anderson, 1949 Cerro Gordo St., Los Angeles, Cal.; Bert Engleman, Box 606, Asheville, N. C.; C. Sandberg, 15826 Auburn Ave., Detroit, Mich.; Ross E. Thompson, 643 N. Cedar St., Albuquerque, N. M.; V. L. Cannon, Jr., 3500 Harrison St., Amarillo, Tex.; A. James Thomas, Jr., 906 N. 64th St., Philadelphia, Pa.; Leo R. Schober, Dorchester, Wis.; Clifford M. Brown, 144 E. 47th St., N. Y. C.; Howard V. Lane, 15 Hillcrest St., White River Junction, Vt.; and Pvt. Herman Reiland Grove, Brooks Field, San Antonio, Tex.

END

Average Air Traveler

TODAY'S average air traveler is male, between 31 and 50 years old and an executive, reports United Air Lines. A survey shows men make up 70 per cent of passengers. Nineteen per cent are professional men; 64 per cent are proprietors, sales managers and other executives; 14 per cent are clerks and kindred workers; and three per cent, surprisingly, are housewives.

Thirty-nine per cent are between 31 and 40, 33 per cent between 41 and 50. Growth of pleasure travel by air is shown by the 20 per cent now flying for other than business reasons, as against 10 per cent a few years ago.



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Skill Derby

(*Continued from page 42*)

prooching plane, at the cost of plenty of points and some strain on the shock cords.

Part of the next course led across sparse woods without major landmarks to a landing at Chehalis' green, meadow-like (and rough) airport, in sharp contrast to the metropolitan fields so far encountered. With 27 planes in the air, pretty well bunched by now despite their two-minute intervals, the traffic was heavy. Next the course lay over woods and farms beside a prominent river to a dead-sock landing at Kelso, just two miles from the Reynolds aluminum plant (now under construction and forbidden to flyers), where 60,000,000 pounds of aluminum soon will be produced annually for bombers. Here one contestant, fooled by the limp wind sock, approached down-wind toward a correctly-headed contestant. Both veered off in plenty of time, but again at the cost of heavy demerits.

From Kelso the planes flew along the Columbia River to Vancouver, Wash., where the Aluminum Company of America's $15,000,000 plant is producing 150,000,000 pounds of raw aluminum annually, more than the whole nation produced in the last war. This area is not forbidden to flyers. Taking off over the edge of the city, the contestants dropped down on Swan Island in the Willamette River at Portland, Ore., only five miles away, to end the three and a half hour tour. By 3:30 the score sheets from all seven airfields were in the hands of the final judges. By 5:30 the winners were announced. The top four, in order, were Robert J. Hart, Portland, Ore., $50; E. Holly Fletcher, Seattle, Wash., $35; Jack Hazen, Portland, Ore., $25; and Patti Canada, also of Portland, $15. In the interval enough "field flying" was indulged in to have taken all 28 planes across the continent. Pilots got better acquainted than they had in years. Most admitted they had welcomed the contest as an excuse for some cross-country time and some hot "hangar flying." Even the ablest and most experienced admitted he had learned something about shooting spots on strange fields. All agreed they had re-learned a lot of rules of safe flying.

The course was well chosen to present a cross-section of all problems likely to be encountered on a trip across the country—cities and hamlets, salt water and lakes, woods and plains, landmarks and compass flying—and all kinds of fields, from Boeing, with its control tower and its frequently confusing right-hand (clockwise) circuit, to Olympia, with its dirt field; Chehalis and Kelso, with their grass mats; and Vancouver and Portland, with their water approaches and variable circuits.

The flyers weren't the only ones who had fun. Big crowds lined the airports, where announcers explained the meaning of the maneuvers, incidentally selling listeners on the ease and safety of modern lightplane flying.

Roy Sugg had fun, too. He thinks maybe he'll try it again next year. Roy learned to fly 13 years ago. Since then he has logged more than 900 hours, including several trips across the country. He's flown everything from 40 h.p. *Cubs* to an old Bird and a latest model low-winged Bellanca with retractable landing gear. The lawyer-pilot has played an important part in the formation of about 50 flying clubs in the two states in the past five years—before CPTP began turning out pilots—a record unequalled in the west and maybe in the east. Not flying alone, but the promotion of private flying, is his hobby. Hence the Roy C. Sugg lightplane contest, which is on its way to becoming an annual affair.

END

Hemisphere Defense

(*Continued from page 50*)

ing their sway over South American air routes at the expense of Nazi-dominated lines. New Panair bases now dot the vital east coast jungle route northward from Rio de Janeiro, a fact of immense strategic importance should United States Army planes be called on to speed southward to head off an incursion across the narrow waist of the South Atlantic from Africa to the bulge of Brazil.

Then there is the arrangement by which bombers and transports being ferried from Miami to Britain's Middle East front may refuel in Brazil before starting the 1,600-mile hop to West Africa.

There is a joint United States-Canadian defense board—but no such agency for mutual protection of the southern continent.

Full advantage has not yet been taken of the tendency in Latin America to draw away from the aerial comradeship with Germany and Italy which was developing on the eve of the war.

For this projected exchange of pilots, the opportunity is wide open. The way has been cleared by such action as that by Congress in making Western Hemisphere nations eligible to benefits of the Lend-Lease Act and the assurance of Secretary Hull a year ago that Atlantic bases acquired from Great Britain were available to friendly neighbors of the United States for the common defense of the hemisphere.

END

Proposes Loan Fund

A REVOLVING loan fund to finance training in CAA-approved schools of young men ambitious to become mechanics and engineers but who lack money has been suggested to the CAA by Maj. C. C. Moseley, Curtiss-Wright Technical Institute president. The loans would bear a stated interest rate and be repayable out of salary.

"The bottleneck of mechanics and engineers now vitally felt in the aircraft industry is not a bottleneck of manpower, but one of finances," says Major Moseley. "Since this plan is self-liquidating, it would cost the government nothing and would be far more effective than the present plan of subsidizing colleges, which requires them to devise short, practical courses.

The Spectators Pay

LA GUARDIA FIELD'S spectator promenade—a strip 20 feet wide and 1,500 feet long from which planes can be observed—is proving a valuable revenue source for the airport. Daily average, at 10 cents a head, was $500 last year, or a total of about $140,000. On one day visitors' fees hit $2,300.

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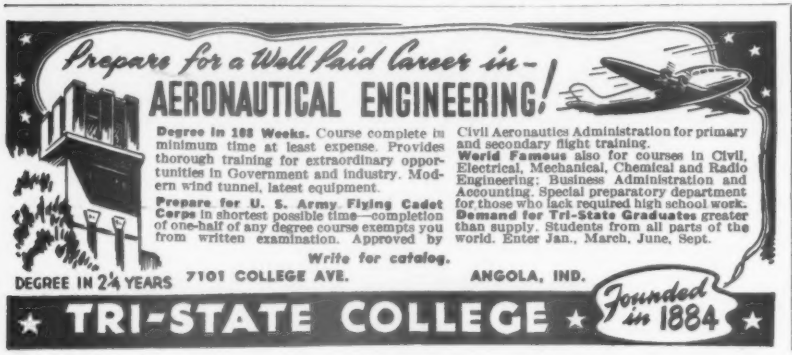
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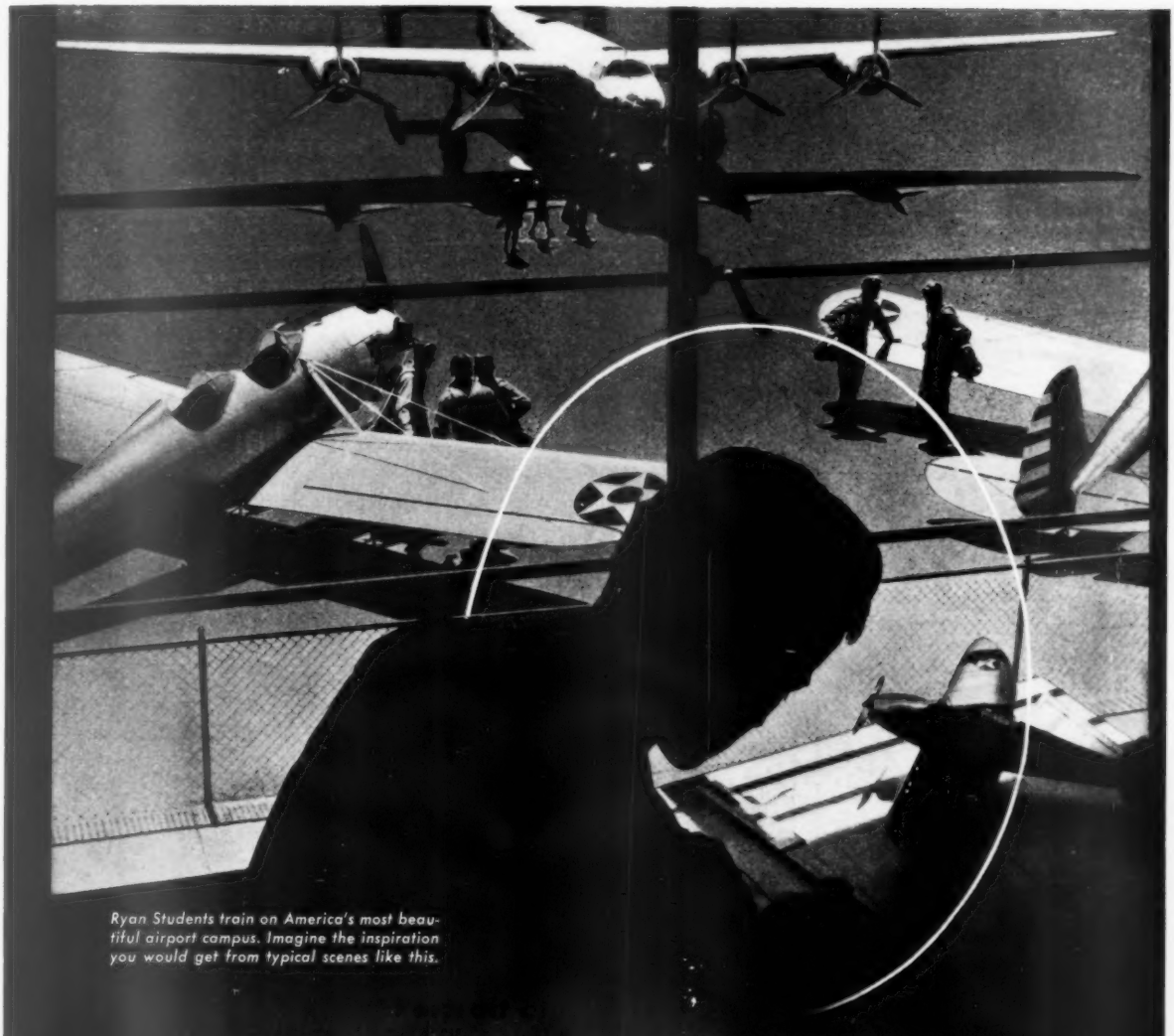

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INDUSTRY ITEMS

Instrument flight training is being given TWA first officers in three new four-place Stinsons. An instructor, in the

front seat, has normal visibility, but the co-pilot, behind him, has none and must fly completely "blind." The ships were built to TWA specifications and have three sets of controls.

A new night safety device for small airports which, picking up the sound of approaching planes' motors, automatically turns on the field floodlights, is reported perfected by the Padua Burglar Alarm Corporation, Cohoes, N. Y. The lights turn off after giving the ship reasonable time to land.

A new $350,000 service hangar has been put into operation at Burbank, Cal., by Lockheed Aircraft. Designed for 20 planes the size of Lockheed Lodestars, it has 96,000 square feet of floorspace and is equipped for every type of service and repair work. It is the aircraft manufacturing industry's only building designed solely for this purpose.

Mass X-raying of all aluminum castings to insure defective materials' rejection is now standard practice at the Triplett & Barton Laboratories in Lockheed Aircraft's Burbank, Cal., plant. Four automatic X-ray machines—only ones of their kind in the world—radiograph as high as 20,000 parts per 24-hour day.

Appointment of Dr. Alexander Klemin as Guggenheim aeronautics research director and of Charles H. Colvin as Daniel Guggenheim School of Aeronautics director has been announced by New York University. Dr. Klemin, Guggenheim School head since its founding in 1925, requested the new post so he might concentrate on research and teaching instead of administration. Colvin, former instrument companies' executive, has been acting chief of the U. S. Weather Bureau's instruments division since 1940.

Simultaneous use of one antenna on several frequencies is a newly-patented airline radio development conceived by Howard K. Morgan, TWA communications

superintendent. It is reported to give effective, interference-free reception. Another recent TWA patent covers a shielded loop antenna, product of experiments by John Franklin, company secretary, whose work in the shielded loop antenna field won him the National Air Board's 1937 safety award.

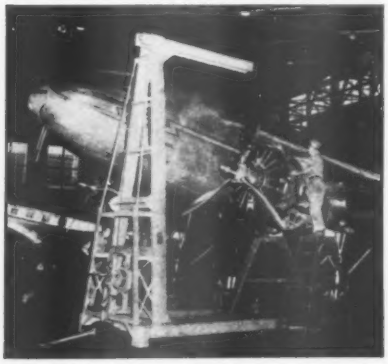
Don A. Luscombe, long prominent in the aviation industry, has been named aircrafts parts division head of the Reynolds Metals Company's Louisville, Ky., plant.

A 700,000 pound hydraulic press, one of the first units completed at the Hydraulic Press Manufacturing Company's new Mount Gilead, O., plant, is now forming bomber fuselage parts in England. The giant exerts 10,000,000 pounds of force and is an exact duplicate of one built for Douglas Aircraft in 1937. It is the largest self-contained hydraulic press ever built.

A new condensed catalogue of standard industrial spray-finishing equipment has just been issued by the DeVilbiss Company, 300 Phillips Ave., Toledo, O. Designated the "IE" catalogue, it brings all prices and specifications of the company's industrial line up to date.

Ralph Middleton, former Curtiss-Wright landing gear design engineer, has become chief engineer for Aircraft Accessories Corporation, Burbank, Cal. A University of Michigan graduate, Middleton was with the Air Corps for 11 years, the last five as head of Wright Field's hydraulics and landing gear laboratory.

A portable utility crane for servicing airplane engines has been developed by the Lewis-Shepard Sales Corporation, 245 Walnut St., Watertown, Mass. It takes



the place of an overhead hoist and can be used anywhere without the necessity for permanent steel beams.

Sunrise Airport, South Ozone Park, Queens, N. Y., is being reopened for CPTP use by Archie Baxter, Baxter Flying School proprietor. At least 100 students will receive instruction at the field, an old barnstorming center which has been closed since 1934.

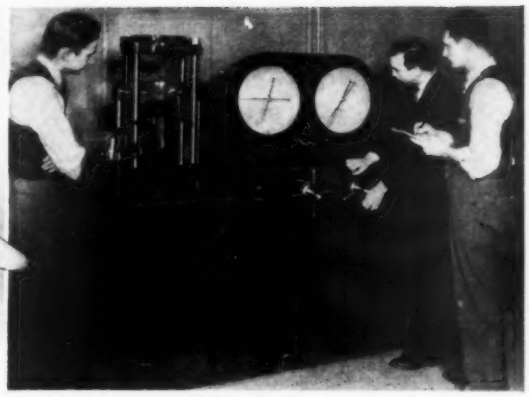
Tips on selection and application of Micarta aircraft pulleys are given in Leaflet 63-220, available upon request from Department 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. A feature of the four-page leaflet is a chart showing pulley weights and dimensions for various standard cable sizes.

Carl J. Andrae has been appointed assistant sales manager of the Wilkening Manufacturing Company's replacement division. The firm, located in Philadelphia, manufactures Pedrick Piston Rings.

A new line of electric, direct-cranking starters for planes with up to 300 h.p. has been announced by Champion Aviation Products, Los Angeles. One model (weight, less solenoid, 16 pounds, 12 ounces) is for engines up to 200 h.p. A larger one, for engines to 300 h.p., weighs 18 pounds, 14 ounces, less solenoid. Both fit standard four- or five-inch mountings. A small lightplane model now is being developed.

Seventy-three apprentice airline mechanics have been enrolled by United Air Lines for training at its Cheyenne, Wyo., maintenance base. They are to augment United's present 755 mechanics and ground service personnel. The apprentices—graduates of airplane mechanics courses at Government-approved schools—will be assigned to major service stations after two years' basic training at Cheyenne.

Rapid expansion of General Armature Corporation's aircraft and automotive divisions has caused the firm to acquire the



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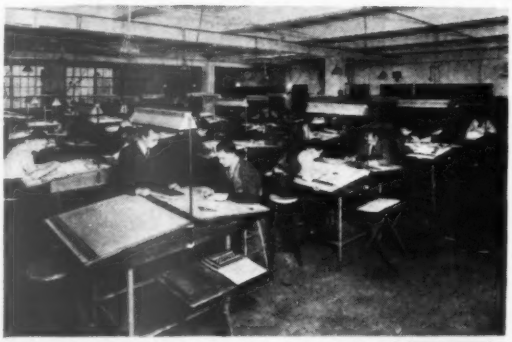

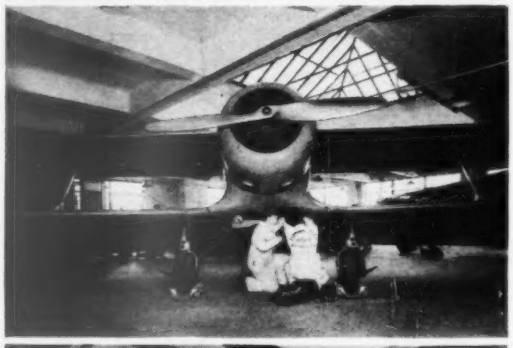

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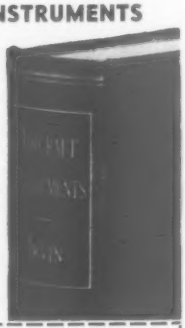

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Formation of an aviation department by the Whiting Corporation, Harvey, Ill., has been announced by Gen. T. S. Hammond, the firm's president. Whiting products used in aviation include cranes, hoists, rotary shears, power hammers, portable jacks and a new bomb hoist specially designed for military planes. H. W. Anderson, former CAA chief of air carrier inspection, will direct the department.

More than 200 students are enrolled at Allen School of Aeronautics, Hillgrove, R. I., a recently-approved aircraft and engine mechanics school. Located at State Airport, it has all three airplane structural types—conventional, all metal and plastic—for instruction purposes.

Group life insurance policies—ranging in amount from $500 to $3,000, according to salaries received—now cover Timm Aircraft Corporation's 160 Van Nuys, Cal., employees. Premiums are shared by workers and company. Hospitalization and surgical benefits are included.

Flexseal safety glass, for use in substratosphere planes, has been originated by the Pittsburgh Plate Glass Company, Pittsburgh, Pa. A special non-shatterable plastic with the transparency of glass, it is reported not to leave the frame nor release cabin air-pressure even if broken.

A three-shelf portable parachute rack which can be wheeled about airports has been designed by Rudy Van Devere, manager of Akron Airways, Inc., to encourage

student pilots to store their 'chutes properly instead of throwing them on the ground.

A hand starter for Lycoming 50 and 65 h.p. lightplane engines has been announced by Aero Starters, 118 Sixth St., Pittsburgh, Pa. Weighing less than six pounds, it is operated by pulling a handle in the cockpit.

Rivets placed in their proper holes, then covered with adhesive tape, are held securely until the hammer drives them home, states the Industrial Tape Corporation, 1450 Broadway, N. Y. C.

A gasoline-powered battery booster for flying fields, camps and other sites where mainline power is not available has been put on the market by W. D. Foreman, 32 E. 54th St., Chicago. It can deliver a full charge in 40 minutes without injury to battery.

Simmonds Aerocessories, Inc., 10 Rockefeller Plaza, N. Y. C., has appointed Albert J. Olson development and service engineer. Formerly maintenance superintendent of Northeast Airlines, Inc., Olson has been in aviation since 1929.

Two new distributors—Bennett Air Service, Hightstown, N. J., and Van Dusen Aircraft Supplies, Minneapolis—have been appointed by Freedman Burnham Engineering Corporation, Cincinnati, manufacturers of adjustable pitch wood propellers.

A manually-operated airplane jack, easily moved and requiring little floorspace, has been developed by the Duff-Norton Manufacturing Company, Pittsburgh, Pa. Capacities of various models range from five to 20 tons. The larger ones may be operated either manually or electrically.

Radio direction finding with a conventional aircraft receiver is reported possible if a new directional loop antenna devised by the aviation radio section of RCA Manufacturing Company, Camden, N. J., is used. With it civilian pilots can direct their planes toward a radio beacon or broadcasting station. By simple navigation and radio bearings they can plot a course in any direction.

The "Orientator," a table-top device for teaching flight students radio navigation, is being built by American Air-

craft Radio, Hawthorne, Cal. Elaborate radio navigational training is provided in a single compact instrument.

Laminated plastic dial faces are replacing those of aluminum and brass at the Ashcroft Gauge Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. Enough aluminum for 350 Air Corps trainer plane engines will be saved annually through the substitution. The makers state the plastic will not warp, corrode, rust, or crack, and is superior to metal for dials. Faces are unglossed white with jet black markings.

A new Doall precision surface grinder with handwheel graduated in half-thousandths and an auxiliary vernier adjustment for feeding in tenths now is available from Continental Machines, Inc., 1301 Washington Ave. S., Minneapolis. The device features flush type lighting, dial indicator giving direct measurement between wheel and work in tenths and an adjustable dust or flash guard.

END

New Radio Link

THE New York-Chicago airway is the first link in what CAA technicians hope will be eventual conversion of Federal airways' entire 35,000 miles from intermediate frequencies in the 200-400 kilocycle band to ultra-high frequencies between 119,000 and 126,000 kilocycles, Administrator Donald H. Connolly reports.

Ultra-high frequency radio wave utilization eliminates static interference interruptions inherent in low frequencies and assures signal strength uniformity in the pilot's headphones. These frequencies continue straight on away from the earth's surface and are never reflected, so are not subject to fade-outs nor interference from other stations' transmissions. They do not "bond" or "split" over mountainous terrain. Another attractive feature for airway use is the availability of a much greater number of frequencies, permitting the installation of as many stations as may be required not only to take care of the existing airways but those which may be established later. A band has been set aside specifically for this purpose by presidential order.

Check Your Controls

NEGLIGENCE in checking control columns was listed in a recent Civil Aeronautics Board bulletin as the primary factor in six separate crashes investigated by the Board. "Make certain, prior to every flight, that control sticks are properly installed and in good working order," the bulletin warned.

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In planning the facilities and curricula for this new division of Polytechnic College we have avoided the commonplace. Our goal is to turn out superior trained man-power to fit the needs of this rapidly expanding industry. We have not time for ordinary "monkey-wrench-mechanics" or for theory burdened engineers. We have planned (and with years of educational experience) a program to turn out an aviation machinist... an instrument technician...a craftsman...a practical engineer...all of whom will meet the "on-the-job" requirements of industry.

That's a big order, but with our background of 43 years experience training engineers, we are highly confident that we will do the job! We have the equipment, much of which can be found in no other similar school in the country. We have the plan and the program, for it has been recommended to us by the aviation industry. Our personnel has been handpicked. We will be one of a few schools of our kind in the country having the power to grant a Bachelor of Science degree in Aeronautical Engineering. We are now applying for government approval as a school and repair station. We will teach engineering...aircraft engines... aircraft instruments...production mechanics...and courses leading to the government license of Aircraft and Engines.

In short, we believe that education in any field is something more than simply installing equipment and erecting a building. It takes people trained in the field of education to properly direct training of young men. We have that experience and reputation. We are now prepared to deliver outstanding training to young men in every field of aviation.

We wish to thank the aviation industry...manufacturers...airlines... suppliers and others for giving unselfishly of its time, experience and suggestions during the past year while we've been making a comprehensive survey of how this institution could best serve the needs of the aviation industry in training young men. We'll be getting a lot of young men "into production" for the industry soon, for Polytechnic College now has "wings"!

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Forced Landings

(*Continued from page 38*)

plest: it is a cross-wind approach from about 800 feet. Here the procedure is simple: nose over, turn to the down-wind position, "K," (so-called "key position"), and then glide into the field. By varying the turn it is possible to land the plane on any spot. A forward slip *must* be used —a squeeze over the treetops is considered unsatisfactory.

In Figure 2, the same emergency is given farther across the field. To turn back will hide the field and require 360° of turn, while the approach indicated requires only 270° with the field in full view at all times. The object is to reach the down-wind side of the field and slip off the excess altitude in the same manner as in Figure 1.

Figures 3 and 4 are self-explanatory. First nose over, then go to the "key position" down-wind and finally use a slip to land in the field. Note that the pilot never turns his back on the field and that he turns only a little more than 180° to make his approach.

In Figures 5 and 6, the same holds true. In any emergency, once the pilot is 1,000 feet over his field, this technique applies. First, assume a normal glide and *keep it;* second, get down-wind of the field by the shortest route*; third, turn into the field and use a slip to make the field.

Naturally, rule 3, "turn into the field using a forward slip," assumes that the pilot will always stay *closer* than gliding distance from the field. He should arrive at K, the "key position" on the down-wind side, with so much altitude that an immediate turn into the field will cause him to land at point X in Figure 1. A deferred turn into the field will cause him to land at point Y and a still later turn will land the plane at point Z. But all three approaches must involve excess altitude and the use of a forward slip . . this is to compensate for wind, brake effect of an idle propeller, down drafts, pilot error and other miscellaneous items.

In Figures 7 and 8, the pilot may turn in either direction, according to his judgment, but once having made up his mind he should proceed on his way and forget the alternate route.

The procedure for selecting fields from higher altitudes is not given here because all the 41 accidents in 1940 occurred from low altitudes. It is here that the danger lies: first, in not maintaining a normal glide; and second, in not gliding into the field with excess altitude and employing a forward slip to dissipate speed and altitude. Wild maneuvering close to the ground, trying to turn the longest way into the wind and *failure to adopt and use a definite* procedure in shooting a field, are basic causes of such crashes.

A pattern, such as one used in shooting for a mark, is the worst kind to use in an emergency, simulated or real, because it takes the pilot too far from his field. Those of us who have used the well-known triangular method will agree that it is easy to undershoot using that method and an undershot on a real emergency is just too bad.

Finally, here are a few pointers laid down by the Safety Board regarding simulated forced landings. Use these in conjunction with the method outlined above and avoid one of the accidents in 1941:

"1. The student should be thoroughly familiar with the stalling speed and gliding angle of the plane." In other words,

(*Continued on page 113*)

Shot Down!

PERHAPS the most vivid description of a wartime parachute jump ever written is that of Flying Officer Ralph Hope, RAF. Hope, a nephew of the late Neville Chamberlain, subsequently was killed in action.

"Saturday was not such a successful day from my point of view, as on our third patrol I lost my aircraft," he wrote. "We were at about 21,000 feet when a squadron of Me-109's got me even before I saw them.

"I first felt a curious sort of bump. As I turned to see what was up my controls felt funny, a lot of red sparks and black smoke appeared round my feet and a cloud of white smoke—probably glycol—streamed back from the engine. The aircraft began going downhill fast. I slid back the hood to get out; my goggles were whipped off and my helmet lifted up in the slipstream. I realized I had not undone my straps so I pulled out the retaining-pin and stood up, standing on anything handy—the seat, the instrument panel, or the stick, I really don't know which. The air seized me and there was a wrench as my oxygen tube snapped off; I had forgotten to undo it. I shot out into the sky.

"The airplane disappeared. It was nice and cool falling. I was head down, of course, but found the position quite comfortable. There was no sense of speed, nor any feeling of falling. I had a look at the clouds below me (they were at least 4,000 or 5,000 feet), then collected the odd bits of my helmet and had a look around. My parachute was still on my seat, both my boots were on and I didn't seem to have lost anything except my goggles and a handkerchief and map. They must have fallen out of the pockets in my knees when I first went upside down.

"After a while I thought about pulling the rip-cord. I seemed to have fallen a goodish way, so I pulled. The canopy streamed out, there was a hard jerk, and there I was, right side up, quite comfortable and floating slowly—oh, so slowly —earthward. I was at about 9 or 10,000 feet then, so I had fallen for about 8 or 9,000 (from about 18,000 feet) and might have fallen further with advantage. When I looked up I could see the shining white canopy above me and little silver specks having no end of a dog-fight in the clear blue. A *Spitfire* dived down past me with a high-pitched whine, but that was the only disturbance. The parachute began to swing me about and it was not long before I felt sick—very sick, in fact, by the time I landed.

"It was fun going into the clouds. The sun played a sort of 'Spectre of the Brocken' effect on my shadow as I approached them. When I emerged, the

Dear Joe:

Your letter was almost as good as a visit with the gang. I'm not surprised that so many of the fellows back home are getting into aviation. It's one business where a man really has a chance.

But it's the guy with the training who's going places in aviation. There's no industry in the world that's so desperate for trained men, and believe me, they really give 'em the training here at Swallow.

You ought to see this layout -- tools and equipment that would knock your eye out. And the swellest bunch of instructors you ever saw. And brother, they know their stuff. Honest, you couldn't find a better school than Swallow.

The location's a natural, too. I wish you could see the four big factories here in Wichita, all going like mad with millions and millions of defense contracts, and expanding every day. I drive around a lot evenings and look 'em over, trying to decide which one I want to work in. It won't be long now.

Hoping to see you here before long,

As ever,

Jim

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countryside looked pleasantly open and after drifting quite a way I thought I saw where I should land. Two farm hands had the same idea. We were all wrong as, in spite of attempts on my part to avoid it, I came down in a spinney of young oak trees, pulling up short about 20 feet from the ground, hanging in my harness. I managed to get hold of a trunk, pull myself over to it, get out of the parachute harness and climb to the ground, where I remained quite still until I was found. The army soon took charge of me, gave me a drink and some lunch and drove me back to my base.

"The only damage I sustained was a hefty bruise on my right shoulder from hitting the tail as I jumped, and a bruise on my leg and a torn trouser from the somewhat unceremonious descent through the upper branches of the oak tree."

The writer was killed on his first patrol after returning from sick leave. He stayed in his crippled *Hurricane* until he was certain it would fall clear of any buildings. When he at last bailed out he was too low to make a successful parachute descent.

END

Mobile Mechanics

(*Continued from page* 54)

In some cases new ideas have been incorporated in these machines, greatly increasing their efficiency.

Total estimated value of equipment at Patterson Field—in shops and offices—approaches $100,000,000, not including aircraft on the field.

Mechanics are trained by working with experts on motors, propellers, wings and airplane parts. Motors are completely torn down and overhauled while students look on. Then, they try to do the job themselves.

In maintenance and repair shops, propellers are taken apart and precision-tested. Old parts are replaced with new. Wings are recovered, controls adjusted and every functional part of an airplane is reconditioned and checked. Recruits get first-hand training as apprentices.

Radio experts have their own offices and shops. Here recruits work with the latest radio equipment. They become familiar with the intricate mechanisms in the new equipment; they learn to dismantle, assemble, test and operate it. Night classes also are conducted there by regular Air Corps officers.

The most interesting place at the field, so far as recruits are concerned, is the pattern-making shop. Inside a huge hangar enlisted men work with wood. Airplanes sometimes need parts requiring new patterns. These are needed so that builders and construction workers can duplicate a worn out part without sending the ship back to the factory. So patterns are sent to the foundry.

Here men turn out such things as tent poles and stakes for portable hangar tents, wheel chocks and other wood necessities. They cut patterns of wing ribs and fuselage formers.

Patterson Field officials say there is considerable interest among recruits to get into woodworking. They attribute this to the excellent work done by manual training schools throughout the nation in teaching students to work with their hands.

Enlisted men also are taught acetylene welding, working with the metal structure of airplane fuselages.

Officers at Patterson Field also take pride in the aeronautical engineering course.

"It gives the men a chance to use their creative minds," one officer puts it, "and they jump at the chance to design their own creations on paper and present them for acceptance. Some of them who show special aptitude are put into advanced engineering schools in large universities throughout the United States. Some come out officers."

All of this is happening now. Hundreds of young men are joining up and there are very few complaints. They have good food, good quarters to sleep in and when pay day comes they have fun —even at $30 per month.

END

Ocean Flying

(*Continued from page* 60)

would be raised only 27 pounds. If a corresponding one per cent increase could be made in the Boeing, however, 240 pounds would be gained, or slightly more than the allowance for one passenger. Such possibilities justify expense and effort for research. Further, their fulfillment is essential to the successful future of transoceanic air transport.

The advance of aircraft design is in dynamic forward motion. We can, I feel, look forward to 80-pound wing loadings, aspect ratios of 11, useful-to-gross weight ratios of 50 per cent. Efficient 3,000 h.p. engines are in prospect. With advances such as these in the offing, who would be bold enough to predict the distant future?

In these past two years transatlantic passenger service already has become a fact, a vital link between the new world and the old. Before the next two years have passed, I believe we can with confidence look forward to frequent, daily flights, operating on 12-hour schedules, to bridge what was once a great barrier ocean.

END

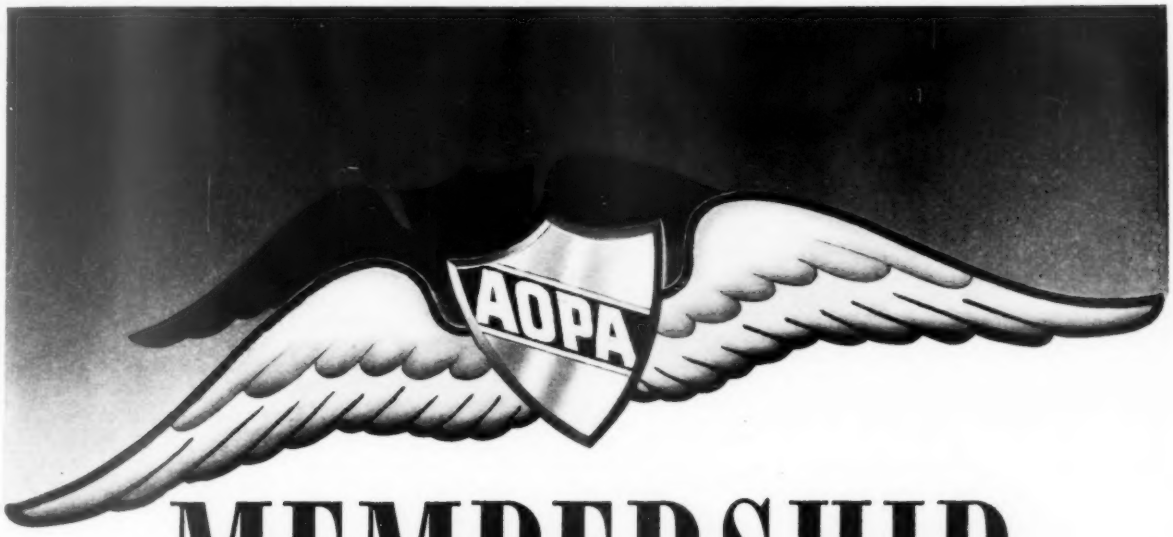
Ground Flying

(*Continued from page* 36)

Civil Air Regulations because it is less abstract. Students readily learn to work out wind drift and radius of action problems. Maps and geometric figures necessarily are used and there are practical exercises with them to help the class's students acquire the requisite experience and understanding of their use.

After going through the primary course, interested persons, whether CPT's or not, can take the secondary course in 126 hours. This course consists of instruction in advance aerodynamics and aircraft structures, aircraft power plants and advanced navigation.

END



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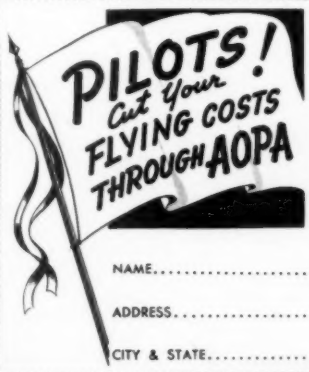

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From Headquarters

(*Continued from page 36*)

sulting benefit to the public should be made an honorary member, with pay, of his august body; but one who sets one up and uses it merely to obtain personal publicity automatically should be ignored by his constituents at the next election.

* * *

We looked over the post card poll of Congress made by the Hon. Frank Osmers, Congressman from New Jersey. It ran about 20 per cent against a cabinet officer for air with an independent air army or force, 60 per cent for it and 20 per cent undecided. The latter—the 20 per cent who were undecided—complained that there was no clear-out definition outstanding of what folks meant by the loosely-used term, "separate air force." Another nation-wide poll, we are told, ran about the same as this.

* * *

When the truth is known of Harry Hopkins' flight over Germany last week to Moscow and return, flying at 30,000 feet, using oxygen and thumbing his nose at Hitler's best as they hung on their props in the rare air trying to get "up and at 'em," it really will be a classic in aviation history; a milestone, too, in diplomatic meetings.

* * *

Interest in gliding caused one of the so-called surges this month. Gov. Blanton Winship, Sen. Joseph E. Rosier, Representatives Osmer, W. H. Sutphin and others adjourned early one morning this month on a bright, cool day to the Congressional Airport located en route to Rockville, in nearby Maryland. Brig.-Gen. George E. Stratemeyer—appointed chief of training in the Air Corps a few days before—was on deck with Maj. Walter S. Lee, who has charge of the glider project. The sailplane was a beauty, made by boys of the National Youth Administration and piloted by Ted Bellak of that agency. Most of the notables enjoyed hops. Soaring seems so safe, so inexpensive, so simple and easy, so stimulating and replete with good exercise in the wide open spaces, that one is safe in predicting mounting interest both in official and private circles day by day from now on. Plenty of good will come of this. Plasticized wood seems destined to be the material employed in construction. Sailplanes up to 14-passenger capacity appear to be a reality. Not the least of the arguments put forth by glider proponents for training is one seldom heard. Silent and serene in the atmosphere up there the instructor can converse with his student in whispers nonchalantly and with no fuss. In one a man feels as though the wings and tail were part of himself as he "feels" the air and flies with his flippers, ailerons and rudder ever on the lookout for favoring air currents.

* * *

Many of our old friends of World War days in the Air Corps and the U. S. Air Forces of the Army have high-sounding titles but, while it sounds good, it is not so fine for some because in many cases these titles do not carry—as in the Navy—pay commensurate with the high office. After the last war, Great Britain raised one of her great admirals to the peerage. Naturally, all his life being a dutiful naval officer, he did not have much of the material things of this world, so the king gave him a million dollars so that he could enjoy it and bring in his friends now and then for a cocktail and a ride with the hounds with him. No man should be compelled to do the job of a general unless he gets the remuneration of that rank. For every day on duty as such he should later be reimbursed, even though it requires special legislation.

* * *

Would that someone would show us, as did Tony Fokker with his D-7 fighter of the last war, how to construct airplanes more simply, more rapidly and at lower cost. Let us issue a note of warning. No matter how rosy the prospect of plastics or what-not, do not stop present construction or modify present outstanding contracts. Keep all these in a separate, water-tight compartment. Turn the heat on new models, new construction, new processes, new power plants, but *do not contract for them in production until they have been thoroughly service-tested* in units of the size of a squadron *in the field* for at least one month.

* * *

Production of aircraft for military purposes does not satisfy officials down here. There has been a slight sag this month. Failure of expected results of the automobile business disappointed the OPM and other bigwigs; they did not appreciate that an airplane is a "different breed of cat" than an automobile. Rumor has it that the slip-up here may be the motivating item to change the mind of the President on some things vital to the handling of Orville Wright's baby.

* * *

We have many agencies of the Government down here connected with flying in one way or another useful to our taxpayers. Let no one overlook, however, that the four main branches of the Federal Government having to do with flying are the War Department, the Navy Department, the Department of Commerce and the National Advisory Committee for Aeronautics. To find out their relative importance it might be helpful to look up the U.S. budget and find out how much money each receives annually.

* * *

While the Lafayette Flying Corps, famous outfit of the last war, is well represented by officers on active duty—many here in Washington—there is only one member of the famous old Lafayette Escadrille on active flying status today. Lieut. Col. Christopher W. Ford, a regular in the U.S. Army Air Forces. In the last war he was shot down in enemy territory and escaped from a prison camp the day the Armistice was signed.

* * *

Maj. Conrad H. Biddlecombe, a hard-hitting, sound-thinking old engineer from the Wright Aeronautical Corporation, is with the British Air Commission down on Massachusetts Avenue. Lee Hardesty, Jr., well known in aeronautical circles during the years since 1921, recently joined his staff. One would be surprised to see the large number of Americans working over there and doing a grand job. But do not apply for a position unless your past is as clean as a hound's tooth, for the FBI goes through one's record like milady's fine-tooth comb through a Pekinese dog that has been housed with an alley-hound.

* * *

Johnny Montgomery of Consolidated was seen scurrying down Constitution Avenue with tins of film under his arms. "Shots of Rube Fleet's plant," he said, as "Gee" men followed him stealthily, ducking from tree to tree behind him.

* * *

Which aircraft manufacturer was supposed to be arranging to place a plane with gas and oil, gratis, at the disposal of men on duty in Washington?

* * *

J. Kelley O'Mara, who aspires to head the military glider training program—none better qualified—, is recovering

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from a month's hospital siege of pneumonia.

* * *

That tall "assistant camera man" seen with Johnny Bockhurst, veteran and dean aerial camera movie man (who from above in a Junkers at Omaha, Neb., photographed the writer plowing through a house in an all-metal monoplane with Eddie Rickenbacker aboard), was none other than Gordon Wayne Kerwood, son of famed Chuck Kerwood. Bockey is the man who takes those pictures of bombs just leaving the bomb racks for earth that one sees every now and then in movie shorts and movie air feature films. With Chuck's son, he toured the White House, the Senate and Sec. Frank Knox's press conference, a real education for any 12-year-old boy. Chuck, the boy's father, holds a commission as colonel in three armies and is now on active duty as major in the Air Corps Intelligence.

END

Radio Checking Eased

FREQUENCY measurement of non-scheduled aircraft transmitters need be checked only twice yearly if the equipment is modern and has a clear record, the FCC announces. No check is necessary when a ship is in dead storage, but frequency must be measured again immediately after the plane is put back in service. A technician with a second class operator's license, or higher, must supervise adjustments.

Letters

(*Continued from page 6*)

Sirs:

. . . The staff . . . is to be commended for the superlative editorial contents of the . . . issue. In the Institute library of 18,000 aeronautical books there cannot be found as comprehensive and detailed a description of the many phases of military aviation. It will be the standard reference work on Army aviation for a long time. Pictorially, it is superb . . .

LESTER D. GARDNER,
Executive Vice President,
Institute of the Aeronautical Sciences.
New York, N. Y.

Sirs:

I . . . wish to extend you my sincere congratulations on having produced one of the greatest special issues I have seen turned out by any magazine. You are entitled to great credit for a marvelous job . . .

ARTHUR CAPPER,
Senator from Kansas.
Washington, D. C.

Sirs:

. . . I think this is the best publication of its kind that I have ever seen and should be in the library of everyone interested in the future of America. It is a great contribution to the subject of our national defense and toward the enlightenment of the American public. I want to take this opportunity of thanking you and your organization for issuing this wonderful publication.

KARL STEFAN,
Representative from Nebraska.
Washington, D. C.

Sirs:

. . . Although I am a constant reader, I am particularly glad to have this issue . . .

GEORGE D. AIKEN,
Senator from Vermont.
Washington, D. C.

Sirs:

. . . You are to be most heartily congratulated on the excellence of this issue. I do not see how anyone can help reading it from cover to cover . . .

Col. FRANK M. KENNEDY,
Office of the Chief of the Air Corps.
Washington, D. C.

Sirs:

. . . The Army issue is certainly a scoop . . . The whole idea was so well conceived and presented, and so appropriate and timely that it is nothing short of a masterpiece . . .

CARL WOOTTEN,
Sales Manager,
Beech Aircraft Corporation.
Wichita, Kan.

Sirs:

. . . This publication is one of the fin-

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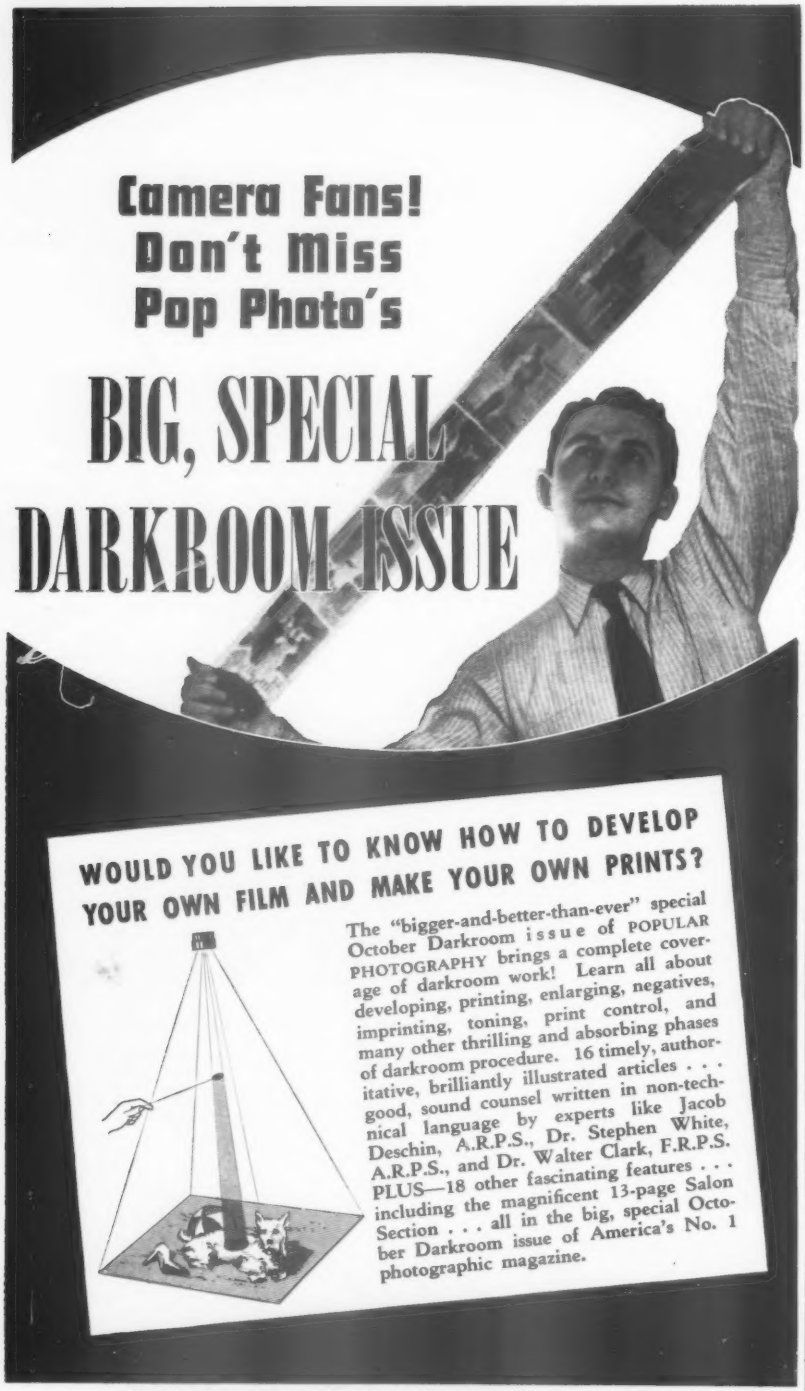
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BERT M. WALLENSTEIN,
Sales Manager,
Freedman-Burnham Engineering Corporation.
Cincinnati, O.

Sirs:

. . . This valuable book certainly will serve its useful purpose in acquainting our flying officers with the structure and activities of the American airplane industry, now of so great importance to the defense of the Netherlands East Indies.

Capt. J. E. MEIJER RANNEFT,
Royal Netherland Legation.
Washington, D. C.

Sirs:

. . . You . . . are to be congratulated for this beautiful issue.

Lieut. Gen. DELOS C. EMMONS,
Commanding,
Air Force Combat Command.
Bolling Field, D. C.

Sirs:

. . . The Senate Military Affairs Committee of which I am a member is giving serious study to all branches of the Air Force and your book will prove most valuable to us.

EDWIN C. JOHNSON,
Senator from Colorado.
Washington, D. C.

Sirs:

. . . Please accept my congratulations on this comprehensive and beautifully presented story of the Air Force. It will do much to crystallize sentiment on the importance of this phase of our defense program . . .

GROVER LOENING.
Garden City, N. Y.

Sirs:

. . . This is as nice an issue on aviation as anything that I have seen . . . It is a most remarkable publication—graphically, topographically, typographically and photographically . . .

WILLIAM B. STOUT,
President,
Stout Skycraft Corporation.
Dearborn, Mich.

Sirs:

. . . Congratulations on this excellent piece of work . . .

EDWIN B. MEISSNER,
President and General Manager,
St. Louis Aircraft Corporation.
St. Louis, Mo.

Sirs:

. . . It is a truly magnificent job—by far the best thing that has ever been done on this subject! . . .

LEWIN B. BARRINGER.
Phoenix, Ariz.

Wants Back Copies

Sirs:

Just had a pleasant surprise—saw my second copy of FLYING since the war began! I've been a steady customer since

1929-30 . . . POPULAR PHOTOGRAPHY I've not seen at all and I'd had every copy since it first came out. . . . I wonder if you can find anyone among your readers who'll drop his copy in the mail when finished with it—back numbers especially welcome; they will go the rounds of the Mess when I've finished with them, 'til this show is over.

I was a photographer and air gunner for six years until changing over to pilot four years ago. You've used some of my photos. Perhaps we'll be able to send you some more *apres la guerre*. Best of luck to both "Populars."

E. M. SHANNON,
Pilot Officer, Royal Air Force.
Somewhere in England

● Readers wishing to send Pilot Officer Shannon back copies of FLYING AND POPULAR AVIATION may address them to him care of the RAF Station, Staverton, Glos., England.—Ed.

"Thunderbolt's" Power

Sirs:

In FLYING AND POPULAR AVIATION'S July issue on page 61 is a picture of Republic's new *Thunderbolt*. The caption says this is the first fighter with a 2,000 h.p. air-cooled engine. I thought the Navy's Vought-Sikorsky XF4U-1 was the 2,000 h.p. air-cooled engine. . . .

LYNN HICKMAN.
St. Louis, Mo.

● Our apologies to Reader Hickman as well as the United Aircraft Corporation. United's Vought-Sikorsky XF4U-1 preceded Republic's *Thunderbolt* by several months, is powered with a 2,000 h.p. Pratt & Whitney *Double Wasp*.—Ed.

Russian Air Force

Sirs:

Why hasn't FLYING AND POPULAR AVIATION published anything about the Russian air force? I would like to know its numerical strength, types of bombers and fighters she has, how well they are armed and how they compare in quality with the German, Italian, British and American ships. Incidentally, I have subscribed to FLYING for two years and I think it is getting bigger and better all the time.

WALTER L. MOCK, JR.
Rochester, N. Y.

● See page 14.—Ed.

Private Flyer

Sirs:

I just finished reading the July issue of FLYING AND POPULAR AVIATION, so thought I would let you know how I enjoyed it. The story about private pilots flying for home defense was especially interesting. I'm a private pilot myself and have a 90A Monocoupe capable of carrying a 480-pound load. If I was still in civilian life—I'm in Navy aviation, learning to be an aviation machinist—I'd be more than glad to fly my plane for home defense.

Oh, yes! Would you mind telling me the kind of plane "Lucky" Wiggins is standing on? It looks swell, but I can't see enough of it to tell what it is.

I have been reading FLYING for over 30 months now—have every copy I've bought . . . I bought my Monocoupe from a used plane ad in the mag. It certainly is a swell listing. . . . Keep up the good work and you'll always have me for a steady reader.

NEWTON T. GRIFFIN.
Jacksonville, Fla.

● Miss Wiggins was photographed standing on a taper-winged Waco.—Ed.

END

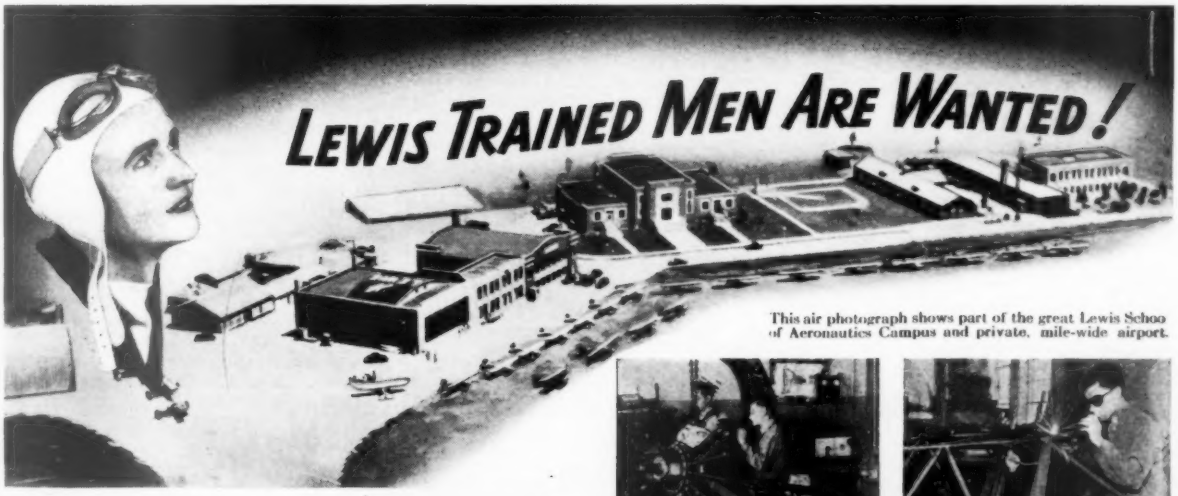
Landing Speeds . . .

(*Continued from page 51*)

In conclusion the values of the maximum lift coefficient for the wing arrangements of Fig. 2 or the maximum lift coefficient for the particular wing in question will choose the curve to employ on Fig. 1 in finding the landing speed. The intersection of the curve with the wing loading ordinate (line running vertically) gives the landing speed on the left side of the chart corresponding in the intersection. This may be done, of course, vice versa to obtain corresponding values of the maximum lift coefficient and finding loading combinations for particular landing speeds. The basis of the landing speed curves is given by the relation:

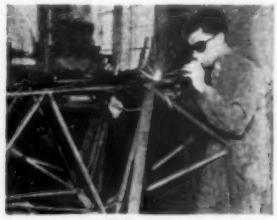
$$V_s = 19.77\sqrt{\frac{W/S}{C_{lm}}}$$

END



This air photograph shows part of the great Lewis School of Aeronautics Campus and private, mile-wide airport.

View of Engine Shop



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Propellers

(*Continued from page 28*)

public often is not aware of its danger. Even personnel . . . are likely to forget it. Many pilots paint the tips so that the propeller describes a colored circle when it revolves, which makes it more apparent.

"It is a pilot's obligation to see that his passengers get to and away from his airplane safely, whether by stopping his engine completely at time of loading and unloading or by providing a definite means of keeping them clear of the propeller if he leaves it in motion.

"Before starting the engine, the pilot should assure himself that the chocks are properly placed; and whether he swings the propeller or operates the controls, he should, as a matter of routine, see that every reasonable precaution is taken against possible accident. Starting his engine without an experienced assistant is a direct invitation to a serious accident which may involve an innocent bystander.

"The flying field is a dangerous place for the general public and persons not experienced in the ground operation of aircraft. Here the pilot's responsibility is heavy and he must have the cooperation of the operator and especially the airport manager. Many modern airports have fences to separate the public from the operator. This reduces the responsibility of the pilot; but should he become careless or fail to appreciate the continuous hazard, he might encounter trouble at any time, especially when flying from rural fields where such important protective facilities are not always available.

"The thoughtful pilot will exercise care when taxiing or turning his plane, to protect the bystanders from the sand blast and the loose stones that fly in the wake of the propeller blast. This sometimes is the cause of minor accidents, such as sand being blown into the eyes of spectators, that are never recorded. It reflects poor technique on the part of the pilot.

"When the flying public demands it, the manufacturers will provide a suitable starter that is practical for the smaller type of plane. This, with the addition of good brake equipment, should eliminate a large percentage of these accidents and allow the pilot to remain in the cockpit at the controls when starting his plane. However, he must be sure that no one is standing near the propeller when he starts it.

"To curb or decrease these accidents, it might be well to emphasize this hazard when training the student and drill into him the various causes of propeller accidents and their results."

END

Airy Chat

(*Continued from page 4*)

frantically for much-needed photographs. We had to replace whole articles at the last minute—literally. Forgotten, but vital, details popped devilishly into our heads at all hours of the day or night. Every one of the 284 pages had to be checked and rechecked several times, read, edited, cut, padded or redesigned. Oh, it was a merry madhouse all right.

And you would like to be an editor!

* * *

WHAT'S-IN-THE-WIND. Certain U.S. engine manufacturers already have 3,000 h.p. engines ready, but are waiting for superchargers that will enable those engines to deliver full power at high altitudes . . . Howard Hughes bought up another chunk of TWA stock recently, bringing his total to almost 416,000 shares . . . During July, American Airlines alone used 1,783,414 gallons of gasoline. American, incidentally, is charging off 25 per cent of the cost of their DC-3's annually to depreciation . . . Average weekly payroll of Consolidated Aircraft is about $860,000 . . . Last year, Walter Beech drew $12,449 in salary . . . A model of the Consolidated B-24 was prominently displayed on the desk of a Wright Field officer as long as five years ago . . . Aeronca has on order totaling nearly 100,000 for Army materials "of an undisclosed nature" . . .

The Junta Argentina de Aviacion, an Argentine organization, has collected about 1,000,000 pesos, plans to train 650 pilots by the end of 1941, and is in the market for 30 American lightplanes and five Link Trainers . . . Lockheed and its Vega division recently received contracts totalling $118,654,050 . . . Also, General Motors just got a new $41,366,880 order for Allison engines . . . While Douglas salted away additional contracts totalling $44,857,948.54 . . . But the jackpot for the one day was hit by the Curtiss-Wright Corporation and its combined airplane, engine and propeller affiliates . . . they got contracts totalling $277,260,197.94! . . . General Electric recently got one contract for $21,776,000 worth of turbo-superchargers. . . .

One RAF pilot, Flt. Lieut. Richard N. Cullen, recently was awarded the DFC for shooting down five German planes in one air battle . . . Now going into service with the RAF are numbers of Hawker *Typhoons*, successors to the *Hurricanes*. The *Typhoon* is powered with a 2,350 h.p. Napier *Sabre* engine, which soon may be built in this country. The *Sabre*, incidentally, packs its 24 cylinders into a space less than six feet long . . . Going into service a little later will be the Hawker *Tornado*, similar in appearance to the *Typhoon* and powered with a Rolls-Royce *Vulture* engine.

The Navy is getting a number of special cameras for night photography from the Fairchild company . . . Wright Field recently bought one test engine for $12,800 from the Steel Products Engineering Co., Springfield, O. . . . Certain eastern scientists and engineers are hot on the trail of atomic power for aircraft—and are close enough to success to be able to predict definitely that it will come in the not-too-distant future . . . a major problem then will be protection from cosmic rays at high altitudes . . .

* * *

JOHNNY WATKINS, an F&PA correspondent now on active duty as an Army lieutenant, is reported to have pulled the neatest trick of the year. He was going somewhere on one of the eastern airlines and decided to take along a parachute. The ticket agent informed Johnny he'd have to pay excess baggage rates for the 'chute.

"This parachute is wearing apparel," Johnny's reported to have snapped back. He then climbed into the harness and buckled it on. The airline officials finally agreed it was wearing apparel—provided he wore it on the plane. He did.

* * *

Johnny always was clever.

MAX KARANT.

END

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Laddie Hamilton, Tuscaloosa, Ala.	Super Chief Cont. 65	50 hr.		$2000
Arthur J. Davis, E. Lansing, Michigan	Chief Cont. 65	2 hr.	New	1940
J. A. Atherton, Box 608, Rochester, Minn.	Chief '41 Lyc. 65	120 hr.	New	1750
Geo. T. Webb, Oneida, Tenn.	Chief Lyc. 65	75 hr.		1675
G. E. Verhostra, 2010 Hollywood Pl., South Bend, Ind.	Super Chief Lyc. 65	22 hr.	New	1595
Leeward Aviation, New Kensington, Pa.	Chief 1939 Cont. 65	60 hr.	New	1450
Sky Harbor, Inc., R.R. No. 11, Box 551, Indianapolis, Indiana	Lyc. 65	550 hr.	Topped 450 hr.	1400
Lenhart Flying Serv., Arpt., Marion, Ind.	TF Frnklin. 65	12 hr.		1395
Morristown Fly. Club, Morristown, Tenn.	Chief '40 Lyc. 65	362 hr.	No	1375
Geo. T. Webb, Oneida, Tenn.	Chief Lyc. 65	370 hr.		1300
Cincinnati, Arcft. Serv., Lunken Arpt., Cinn.,O.	TL 65 Lyc. 65	285 hr.	Never	1300
Lane Air Service, Albany, Ga.	Chief Deluxe Cont. 65	375 hr.	Recently	1300
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida	Tandem Trainer Lyc. 65	280 hr.	No	1300
Lenhart Flying Serv., Arpt., Marion, Ind.	TL Lycoming 65	176 hr.		1295
Pierce Flying Serv., Box 894, Eureka, Cal.	Cont. 65	580 hr.	40 hr.	1290
Aviation Market, L. A. Metropolitan Arpt., Van Nuys, Calif.	LW Warner 90	360 hr.	New	1250
O'Neal Flying Serv., Municipal Arpt., Evansville, Ind.	Chief Lyc. 65	300 hr.		1250
J. A. Atherton, Box 608, Rochester, Minn.	Trainer Lyc. 65	110 hr.	New	1250
Lenhart Flying Serv., Arpt., Marion, Ind.	TL Lycoming 65	192 hr.		1250
Inter-City Avia., Inc., Boston Mun. Arpt., E. Boston, Mass.	Chief Lyc. 65	825 hr.	210 hr.	1250
Pierce Flying Serv., Box 894, Eureka, Calif.	65-TC Cont. 65	650 hr.	100 hr.	1250
Tred Avon Flying Serv., Inc., Easton, Md.	Trainer Lyc. 50	236 hr.	No	1238
J. A. Atherton, Box 608, Rochester, Minn.	Trainer Cont. 65	215 hr.		1200
Richmond Air Transp., Byrd Arpt., Richmond, Va.	Chief Cont. 50	510 hr.	30 hr.	1200
St. Louis Flying Serv., Lambert Field, Robertson, Mo.	KCA Cont. 50		Recently	1175
Tred Avon Flying Serv., Inc., Easton, Md.	Trainer Lyc. 55	337 hr.	No	1152
Blvd. Arpt., Inc., Roosevelt Blvd., Phila., Pa.	TL Lycoming 55	150 hr.	No	1150
Jenkins Air Serv., Inc., Munic. Arpt., Rochester, N. Y.	TL Lycoming 65	200 hr.		1150
Springfield Avia. Co., Mun. Arpt., Springfield Illinois	Tandem Tr. Frnklin. 60	303 hr.	No	1150
Boulevard Airport Inc., Roosevelt Blvd., Philadelphia, Pa.	Trainer Lyc. 55	200 hr.	No	1100
Lexington Fly. Serv., Inc., Lexington, Ky.	Chief Frnklin. 50	281 hr.	Topped	1100
Art Whitaker, Swan Island Arpt., Portland, Oregon	Trainer Lyc. 65	700 hr.	500 hr.	1075
Four Lakes Aviation Corp., Royal Arpt., Madison, Wisc.	Low Wing, Deluxe	427 hr.	350 hr. 93 since	1050
United Aero Corp., P.O. Box 222, San Antonio, Texas	Chief Lycoming 50	550 hr.	550 hr.	1025
Cedar Rapids Arwys., Inc., Cedar Rapids, Ia.	TF Frnklin. 60	565 hr.	160 hr.	1005
Edwards Flying Serv., Inc., Flushing Arpt., Flushing, L. I., N. Y.	50C Cont. 50	650 hr.	Recently	1000
Richmond Air Transport, Byrd Arpt., Richmond, Va.	60TF Frnklin. 60	355 hr.		1000
United Aero Corp., P. O. Box 222, San Antonio, Texas	TF Frnklin. 60	750 hr.	635 hr	975
Lenhart Flying Serv., Arpt., Marion, Ind.	TF Frnklin. 60	365 hr.	310 hr	950
Midwest Flyers Lakeside Arpt., E. St. Louis, Ill.	Trainer Frnklin. 60	550 hr.	Jan.'41	950
R. D. Finefrock, Box 301, Tyler, Texas	Chief '38 Cont. 50	500 hr.	Just. relic.	950
Tri-State Aviation Corp., Cincinnati Arpt., Sharonville, Ohio	Frnklin. 60	511 hr.		940
O'Neal Aircraft Co., O'Neal Arpt., Vincennes, Ind.	La65 Lyc. 65	1100 hr.	950 hr.	900
United Aero Corp., P.O. Box 222, San Antonio, Texas	TF Frnklin. 50	1475 hr.	1400 hr.	925
Wallace Arcft. Co., Clarcona, Florida	Trainer '40 Lyc. 65	125 hr.		900
Jenkins Air Serv., Inc., Mun. Arpt., Rochester, N. Y.	TF Frnklin. 60	620 hr.	Major 576 hr.	900
Southern Arwys. Sales Co., Mun. Arpt., Birmingham, Ala.	'38 Cont. 50	300 hr.	290 hr.	900
United Aero Corp., P.O. Box 222, San Antonio, Texas	Trainer '40 Frnklin. 60	875 hr.	650 hr.	875
Jones Fly. Serv., Sullivan Av. Arpt., Cols., O.	K Frnklin. 50	680 hr.	Fact. 150 hr.	875
Cedar Rapids Arwys., Inc., Cedar Rapids, Ia.	TF Frnklin. 60	650 hr.	No time since	867
Tri-State Aviation Corp., Cincinnati Arpt., Sharonville, Ohio	Frnklin. 60	605 hr.		$ 850
SouthernArwys, Mun. Arpt., Birmingham, Ala.	Cont. 50	360 hr.	350 hr.	850
Tri-State Aviation Corp. Cincinnati Airport, Sharonville, Ohio	Frank. 60	715 hr.	688 hr.	840
United Aero Corp., P.O. Box 222, San Antonio, Texas	Chief '40 Frnklin. 50	1670 hr.	1400 hr.	800
Portland Flying Serv., Inc., Municipal Arpt., Portland, Maine	Chief Struts Edo Floats			700
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida	K Aeronca 40	625 hr.	200 hr.	625
Lester Pierce, 2135 Broadway, Eureka, Calif.	C3 Aeronca 36	1430 hr.	Just modern-ized	600
Aircraft Assoc., Inc., Mun. Arpt., Long Beach, Calif.	K Aeronca 40	837 hr.	59 hr. since	600
Aero-Ways, Inc., Mun. Arpt., Cleveland, O.	K Aeronca 40	328 hr.	Just relic	600
Hawthorne Flying Serv., Municipal Arpt., Charleston, S. C.	K Aeronca 40	583 hr.	583 hr.	595
Hawthorne Fly. Serv., Mun. Arpt., Charleston, S. C.	K Aeronca 40	583 hr.	583 hr.	595
Eugene Wise, Wise Airport, RFD No. 2, Uniontown, Ohio	KC Cont. A-40	450 hr.	350 hr.	595
Pierce Flying Serv., Box 894, Eureka, Calif.	Aeronca 36	1550 hr.	20 hr. since fct. maj.	575
Wallace Arcft. Co., Clarcona, Fla.	C3 Aeronca 40	900 hr.	Apr. '41	500
ARROW SPORT				
E. R. Elliott Motors, Coeur d'Alene, Idaho	Arrow Sport V8 82 h.p.	198 hr.	No	650
Aero-Ways, Inc., Mun. Arpt., Cleveland, O.	Sport V8	520 hr.		525
McInnis Aviation Service, Inc., Municipal Airport, Minneapolis, Minn.	Converted V8 85 h.p.	229 hr.		500
Blvd. Arpt., Inc. Roosevelt Blvd., Phila., Pa.	Arrow Sport V8 82 h.p.	450 hr.	90 hr.	500
BEECHCRAFT				
Harry A. Hammill, Box 992, Austin, Texas	Jacob 330	850 hr.	850 hr.	8500
E. W. Wiggins Arwys., Inc., Providence, R. I.	C-17-B Jacobs 285	600 hr.	Recently	4800
Colorado Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	Jacobs 285	800 hr.	Just	4250
BELLANCA				
Art Whitaker, Box 3820, Portland, Ore.	Cruisair Ken Royce 90	95 hr.	none since top	3500
E. W. Wiggins Arwys., Inc., Providence, R. I.	LeBlond 90	150 hr.		2400
Atlantic Aviation Serv., Dupont Arpt., Wilmington, Del.	CH Wright J-5	800 hr.	100 hr.	1695
BIRD				
Lane Air Serv., Albany, Georgia	Deluxe Kinner 100 h.p.	900 hr.	Just	1250
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida	Kinner 90 h.p.	1500 hr.	250 hr.	795
CESSNA				
Aircraft Sales of Michigan, Detroit City Airport, Detroit, Michigan	Airmaster Warner 165	New	New	9244
Tri-State Aviation Corp., Cincinnati Airport, Sharonville, Ohio	Airmaster Warner 145	265 hr.	255 hr.	4850
Hubert & Dillon Air Serv., Box 177-S, Tacoma, Wash.	C-145 Warner 145	475 hr.	ship be'g majored	2950
Bob Wight, Box 447, Alexandria, La.	AW Warner 125	495 hr.	Just Licensed	700
CULVER				
Bishop Flying Service, Inc., Bishop Airport, Flint, Michigan	LCA Cont. 75	285 hr.		200
Tri-State Aviation Corp., Cincinnati Arpt., Sharonville, Ohio	Cont. 75	25 hr.		2000

FLYING and POPULAR AVIATION USED PLANE LISTING OF

DEALERS	MODEL	ENGINE	TIME	OVER-HAULED	PRICE
Foster A. Lane, Pt. Columbus Flying School, Columbus, Ohio	4 place	Cont. 75	105 hr.		$1850
New Mexico Flying Serv., Box 67, Clovis, N.M.	LCA	Cont. 75	93 hr.	No	1850
CURTISS ROBIN					
Johnson Fly. Serv., Inc., Missoula, Mont.	4 place	Chall. 185	800 hr.	2 hr.	875
Geo. Roper, 27 S. State, Salt Lake City, U.		Challenger	800 hr.	Mar. '40	800
Red Bank Airport, Inc., Red Bank, N.J.		Challenger 185	575 hr.	162 hr.	650
CURTISS WRIGHT					
Foster A. Lane, Port Columbus Flying School, Columbus, Ohio		Gypsy 90 h.p.	600 hr.	50 hr.	775
DART					
Ashcraft Bros. Fly. Serv., Mun. Arpt., Lawrence, Kansas	Dart	Ken Royce 90	360 hr.	300 hr. top over'nl	2000
DAVIS					
Dethloff Flying Service, Euclid Avenue Airport, Willoughby, Ohio		LeBlond 90	235 hr.	50 hr.	2000
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Michigan	125	Warner	500 hr.	55 hr.	1200
FAIRCHILD					
Aviation Market, L.A. Metropolitan, Van Nuys, Calif.	24	Warner 145	102 hr.		6000
Thomas Metcalf, Toledo Mun. Arpt., Toledo, O.	24	Warner 145	356 hr.	Topped 306 hr.	3975
T. A. Colbertson, Medford, Oregon	246	Warner 145	800 hr.	350 hr.	3500
Palo Alto Airpt., Inc., Box 640, Palo Alto, Cal.		Warner 145			2600
Jos. R. Higgins, Mozart Park, Wheeling, W.Va.	24	Ranger 145	790 hr.	10 hr.	2500
E. W. Wiggins Airways, Inc., Providence, R.I.	24	Ranger 145	700 hr.	Jan. '40	2500
E. H. Brockenbrough, Mun. Arpt., Charlotte, N. C.	24	Warner 145	350 hr.	Just	2395
Standard Flying Serv., Inc., Somerset Hills Airport, Basking Ridge, N. J.	24	Warner 145	485 hr.		2150
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Calif.	71	Wasp SC-1 450 h.p.	3184 hr.	447 hr.	2000
John P. Hall, West Haven Arpt., West Haven, Conn.	24	Warner 145	348 hr.	Recently	1650
E. W. Wiggins Airways, Inc., Boston Met. Arpt., Norwood, Mass.	24	Warner Series 40 125 h.p.	945 hr.	305 hr. since major	1350
E. W. Wiggins Airways, Inc., Providence, R.I.		Warner 125	1000 hr.	Recently	1350
California Aircraft Corp., Box 170, Van Nuys, Calif.		Warner J5	3000 hr.	175 hr.	1300
Art Whitaker, Box 3820, Portland, Ore.	24	Cirrus 100	1200 hr.	None since Major	1125
Doug Schall, Inc., 33 Clagett Rd., Hyattsville, Md.	KR34	Wright J65 185 h.p.	700 hr.	16 hr.	1050
FLEET					
Aviation Market, L.A. Metropolitan Arpt., Van Nuys, Calif.	10	Kinner 125	350 hr.		2500
Johnson Flying Serv., Inc., Missoula, Mont.	9	Kinner 125	1200 hr.	100 hr.	1750
West Coast Aircft., L.A. Munc. Arpt., Inglewood, Calif.	2	Kinner 100		Just	1550
Granite State Airways, Manchester Arpt., Manchester, N.H.	2	Kinner 100	1300 hr.	1125 hr.	1200
Aircraft Sales of Michigan, Detroit City Airport, Detroit, Michigan		Kinner K5-100	250 hr.	125 hr.	1100
White Fly. Serv., Inc., Caldwell-Wright Arpt., Caldwell, N.J.		Warner 125	1090 hr.	6/40	1095
FUNK					
Aircraft Unlimited, Roosevelt Field, Mineola, N. Y.		Funk 75	130 hr.	Never	1350
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N.Y.		Funk E63	130 hr.	Top	1350
Island Crop Dusting Co., Airport, Caribou, Me.	75B		150 hr.	at 130 hr.	1300
Eugene Wise, Wise Arpt., R.F.D., No. 2, Uniontown, Ohio	B	Funk B3	400 hr.	175 hr.	1095
GREAT LAKES					
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan		Cirrus 95	800 hr.	100 hr.	600
KARI-KEEN					
Huron Flying Serv., Inc., Mun. Arpt., Huron S. D.		Warner 125	270 hr.	75 hr.	750
KINNER					
Schneider Aero Serv., Chandler Fld., Fresno, Calif.	Sportwing	Kinner 125	1303 hr.	450 hr.	1105

DEALERS	MODEL	ENGINE	TIME	OVER-HAULED	PRICE
LOCKHEED					
H. A. Hammill, Box 992, Austin, Texas		Wasp 450		8 hr.	$5000
LUSCOMBE					
California Aircraft Co., Box 170, Van Nuys, Calif.		Warner 90	350 hr.		3000
Carl Evers, 247 Park Ave., N.Y., N.Y.	Silvaire 75	Cont. 75			2650
Pete Grim, RFD No. 4, Staunton, Va.	Silvaire	Cont. 75	90 hr.	None	2500
W. F. Luke, Schenectady City Arpt., Schenectady, N. Y.	Silvaire 8.C	Cont. A.75	70 hr.		2400
Page Airways, Municipal Arpt., Rochester, N.Y.	Silvaire	Cont. 75	121 hr.		2340
Carl Evers, 247 Park Ave., New York, N. Y.	Silvaire deluxe	Cont. 75	150 hr.	Yes	2200
Falcon Aircraft Corp., L. A. Mun. Arpt., Inglewood, Calif.	8A	Cont. 65	350 hr.		2200
C. W. Peterson, Mun. Arpt., Salina, Kansas	8A	Cont. 65	100 hr.	None	2000
Carl Evers, 247 Park Ave., New York, N. Y.	Trainer	Lyc. 65	New		1950
Four Lakes Aviation Corp., Royal Airport, Madison, Wisc.	8B	Lyc. 65 Dual	173 hr.		1850
Air Serv., Inc., Mun. Arpt., Denver, Colo.	8A	Cont. 65	84 hr.		1850
Red Bank Arpt., Inc., Red Bank, N. J.	8A	Cont. 65	65 hr.	65 hr.	1850
Midwest Fly. Serv., La Grange, Ill.	8A	Cont. 65 Dual	125 hr.	None	1850
Aircraft Sales of Michigan, Detroit City Arpt Detroit, Mich.	8A	Cont. 65 injector	590 hr.	90 hr.	1800
W. F. Luke, Schenectady County Arpt., Schenectady, N. Y.	8A	Cont. 65	113 hr.		1800
Doug Schall, Inc., 33 Clagett Rd., Hyattsville, Md.	8B1	Lycoming 65	30 hr.	New	1790
Tacoma Flying Serv., Box 157, South Tacoma, Wash.	8A	Cont. 65	1200 hr.	400 hr.	1750
Midwest Fly. Service, La Grange, Illinois.	8A	Cont. 65	225 hr.	None	1700
J. L. Wells, 106 W. Main, Avon Park, Fla.	8A	Cont. 65	95 hr.	None	1675
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	8A-J	Cont. 65 injector	700 hr.	125 hr.	1650
Knox Flite, Municipal Arpt., Knoxville, Tenn.	8B	Lyc. 65	250 hr.		1600
Upton & Bowen, West Memphis, Ark.	8A	Cont. 65	300 hr.	50 hr.	1600
Midwest Fly. Serv., La Grange, Illinois.	8B1	Lycoming 65	150 hr.	None	1600
Knox Flite, Municipal Airport, Knoxville, Tennessee	8B	Lyc. 65	400 hr.	Appr. 20 hrs. since overh'l	1550
W. F. Luke, Schenectady County Arpt., Schenectady, N. Y.	8A	Cont. 65	350 hr.	50 hr.	1550
Thompson Fly. Serv., Inc., Salt Lake City, Utah	8A	Cont. 65	753 hr.		1475
Albert E. Padags, Tri-City Arpt., Wisc. Rapids, Wisc.	1940	Cont. 65	900 hr.	Major 936 hr.	1450
Thompson Flying Serv., Inc., Salt Lake City, U.	8A	Cont. 65	683 hr.	79 hr.	1375
Doug Schall, Inc., 33 Clagett Rd., Hyattsville, Md.	8	Cont. 50	Motor	100 hr.	1300
Aircraft Unlimited, Inc. Roosevelt Field Mineola, N. Y.		Cont. 50	374 hr.	Just Majored	1250
Knox Flite, Municipal Airport, Knoxville, Tennessee	8	Cont. 55	500 hr.	200 hr.	1200
Albert E. Padags, Tri-City Airport, Wis. Rapids, Wisc.	8	Cont. 55	430 hr.	Topped 415 hr.	1000
MEYERS					
J. A. Atherton, Box 608, Rochester, Minn.	OTW	Warner 125	555 hr.	5/41	4500
MONOCOUPE					
Fla. Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida		Warner 125	945 hr.	240 hr.	1250
St. Louis Flying Service, Lambert Field, Robertson, Mo.		Lambert 90	1000 hr.	Recently	995
Bishop Flying Service, Inc., Bishop Arpt., Flint, Michigan	M5	Velie 65	650 hr.	20 hr.	550
MOTH					
Carl Evers, 247 Park Avenue, N. Y., N. Y.	Gipsy Major 130		New		2800
NEW STANDARD					
O'Neal Aircraft Co., O'Neal Arpt., Vincennes Ind.		Wright J5	720 hr.	700 hr.	1100
Boulevard Arpt., Inc., Roosevelt Boulevard, Philadelphia, Pa.		Kinner 90	1500 hr.	700 hr.	700
PIPER CUB					
E. H. Brockenbrough, Mun. Arpt., Charlotte, N. C.	J4	Cont.65 '40	70 hr.	None	2200
Stiles Motor Co., 260 Main St., Northport, N. Y.	Coupe J4A	Cont. 65	142 hr.	New	1900
Ben A. Funk, Hiway 50, Grover, Mo.	Seaplane	Lyc. 65	New	No	1850
L. L. Rupert, Box 446, Muskogee, Okla.	Coupe '40	Cont.Dual65	155 hr.		1850
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	J4'40	Cont. 65	58 hr.	None	1790
Susquehanna Air Serv., Williamsport Arpt., Montoursville, Pa.	Coupe	Lyc. 65	35 hr.	New	1775
Lynn B. Fellison, 2811 Mulberry St. Joseph, Mo.	J5	Cont. 75	83 hr.	New	1765

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J4'40	Cont. 65	93 hr.	None	$1750
Southern Vt. Fly. Serv., Arpt., N. Springfield, Vt.	Cruiser	Cont. 75	40 hr.	New	1750
Buroker-Hicks Flying Serv., Olympia Arpt., Olympia, Washington	Cruiser	J-5-A Cont. 75	318 hr.	20 hrs. since major	1700
Dubois Avia. Assoc., Mun. Arpt., DuBois, Pa.	J4'40	Cont. 65	97 hr.		1700
McVey Flying Service, Monmouth, Illinois	J5A	Cont. 75	305 hr.		1700
McBoyle Cub Sales, Arpt., Lake Delton, Wisc.	J5	Cont. 75	65 hr.	New	1675
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Illinois	J4	Cont. 65	70 hr.		1675
Rudy Pickrul, Traverse City Arpt. Traverse City, Michigan	Coupe '40	Cont. 65 Dual	62 hr.		1650
Philadelphia Skyport, Inc., Pier Three South, Philadelphia, Pa.	Seaplane	Cont. 65	774 hr.	90 hr.	1650
Herman L. Martin, Munic. Arpt., Walla Walla, Wash.	J4	Cont. 65	450 hr.	25 hr.	1600
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-4	Cont. 65	100 hr.	New	1595
Racine Fly. Serv., Racine Arpt., Racine, Wisc	J-4	Cont. 65	383 hr.	353 hr.	1575
Barr Aviation Corp., Detroit, City Arpt., Detroit, Michigan	J4 Coupe	Cont. 65	175 hr.	None	1550
Southern Air Serv., Memphis, Tenn.		Cont. 65	100 hr.	New	1550
Air City Flying Service, 5500 E. Third St., Dayton, Ohio	Cruiser	Cont. 75	150 hr.		1545
Smith Flying Serv., Wilkes-Barre Wyo. Vall. Arpt., Forty-Fort, Pa.	J-4A	Cont. 65	150 hr.		1500
Smith Flying Serv., Wilkes-Barre Wyo. Vall. Arpt., Forty-Fort, Pa.	J-5A	Cont. 75	150 hr.		1500
E. H. Brockenbrough, Mun. Arpt., Charlotte, N. C.	J4'40	Cont. 65	200 hr.	200 hr.	1500
Al Gillis Fly. Serv., 125 1st Ave., No., Great Falls, Mont	Coupe '40	Cont. 65	350 hr.	None	1500
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-5	Cont. 75	100 hr.	New	1500
Seidner Flying Service, Ralph Seidner, Jr., S.A.M. Airport, Youngstown, Ohio	Coupe	Cont. 65	250 hr.	Recently	1495
McBoyle Cub Sales, Arpt., Lake Delton, Wisc.	J3 Spcl.	Cont. 65	50 hr.	New	1495
Inter City Aviation, Inc., Boston Muni. Arpt., E. Boston, Mass.	'39 Coupe	Cont. 65	196 hr.		1490
Wm. T. Swain, 301 Rochex St., Salinas, Calif.	J3	Cont. 65	593 hr.	170 hr.	1475
Racine Fly. Serv., Racine Arpt., Racine, Wis.	J-4	Lyc. 65	330 hr.	top 320	1475
Aviation Market, L. A. Metropolitan Arpt., Van Nuys, California	J4	Cont. 65	118 hr.	New	1450
J. L. Schroeder, Inc., Box 8053, Houston, Tex.	J3	Cont. 65	98 hr.	None	1440
Piedmont Avia., Inc., Mun. Arpt., Winston-Salem, N. C.	J5	Cont. 75	435 hr.	55 hr.	1425
Lexington Fly. Serv., Munic. Arpt., Lexington, Ky.	J5	Cont. 75	230 hr.		1400
Reliable Fly-Serv., P.O. Box 1303, Bristol, Conn.	J-4	Cont. 65	140 hr.	30 hr. fact. maj.	1400
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Ill.	J5	Cont. 75	575 hr.	Just	$1375
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J3	Frnkln. 65	142 hr.	None	1375
Lynchberg Air Transport and Sales Corp., Preston Glen, Lynchberg, Va.	Coupe '39	Cont. 65	200 hr.	None	1350
Lynchburg Air Transport & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	Coupe	Cont. 65	200 hr.	No	1350
Ben A. Funk, Hy. 50, Grover, Mo.	J3	Lyc. 65	15 hr.	Never	1350
Virginia Cub Distributors, Box 211, Farmville, Va.	Coupe '39	Cont. 65	350 hr.	Just Majored	1350
Virginia Cub Distributors, Box 211, Farmville, Va.	J3	Lyc. 65	145 hr.		1350
Southern Vt. Fly. Serv., Arpt., Springfield, Vt.	J3L '40	Lyc. 65	162 hr.	New	1350
Philadelphia Skyport, Inc., Pier Three South, Philadelphia, Pa.	J-3	Cont. 65 Dual	247 hr.		1325
TriCities Avia. Sch., TriCities Arpt., Endicott, N. Y.	J4'39	Cont. 65	500 hr.		1300
Dethloff Flying Serv. Euclid Avenue Airport, Willoughby, Ohio		Frank. 65	50 hr.	No	1300
Dethloff Flying Service, Euclid Avenue Airport, Willoughby, Ohio		Lyc. 65	100 hr.	No	1295
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Texas	J-3 Trainer	Frnkln. 65	169 hr.	No	1275
Eno Flying Serv., Eno Arpt., Ft. Dodge, Iowa	J3	Frnkln. 65	160 hr.	Never	1275
Southern Arwys. of Danville, Box 205, Danville, Va.	J-3	Cont. 65	385 hr.	Never	1275
Linn County Airways, 221-3rd St., N.E., Cedar Rapids, Iowa		Lyc. 65	120 hr.	New	1260
Bennett Air Serv., Box 247, Hightstown, N. J.	J3 Trainer	Frnkln. 65	299 hr.	100 hr.	1250
Southern Vt. Fly. Serv., Arpt., N. Springfield, Vt.	J3L '40	Lyc. 65	280 hr.	New	1250
Madison Fly. Serv., R. I., Madison, Ind.	J3L	Lyc. 65	205 hr.	No	1235
Mangen F. Warrington, Cub Fly. Serv., Selbyville, Del.	J3 '39	Cont. 55 dual	40 hr.	No	1200
John Ruzicks, Airport, Peru, Ind.	J3	Frnkln. 65	140 hr.	No	1225
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-4	Cont. 65	550 hr.	400 hr.	1200
Galbraith Air Serv., Munic. Arpt., Paducah, Ky.	J3L	Lyc. 65	102 hr.	No	1195
Frank Rensma, Box 441, Youngsville, Pa.	J3	Lyc. 65	150 hr.		1150
Piedmont Avia., Inc., Mun. Arpt., Winston-Salem, N. C.	J4 '39	Cont. 65	385 hr.	75 hr.	1125
L-H Air Serv., Inc., Hatboro Arpt., Hatboro, Pa.	J3	Cont. 65	500 hr.	500 hr.	1100
L-H Air Serv., Inc., Hatboro Arpt., Hatboro, Pa.	J3	Lyc. 65	300 hr.	300 hr.	1100
Madison Flying Serv., R.F.D. No. 1, Madison, Ind.	J-4	Cont. 65	325 hr.	No	1100
Virginia Cub Distributors, Box 211, Farmville, Va.	J3	Lyc. 65	515 hr.	Yes	$1100
Aviation Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 65	528 hr.	None	1100
Madison Fly. Serv., R. No. 1, Madison, Ind.	Coupe	Cont. 65	335 hr.	No	1100
Inter-City Fly. Serv., Inc., Mun. Arpt., Ft. Wayne, Ind.	J3	Frnkln. 65	410 hr.		1095
Piedmont Aviation, Inc., Municipal Arpt., Winston-Salem, N. C.	Coupe	Cont. 65 dual	432 hr.	112 hr.	1085
South Arwys. of Danville, Box 205, Danville, Va.	J-3	Lyc. 55	570 hr.	Never	1075
Buroker-Hicks Flying Serv., Olympia Arpt., Olympia, Wash.	J-3 Trainer	Frnkln. 50	1087 hr.	115 hr.	1050
Des Moines Flying Serv., Municipal Arpt., Des Moines, Ia.	J3	Frnkln. 65	500 hr.	None	1050
Gerald Gallagher, 4507 Marvive Ave., Drexel Hill, Pa.	J-3	Cont. 65	720 hr.	95 hr.	1050
Ken's Cub Flyers, Olean Arpt., Olean, N. Y.	J-3	Frnkln. 60	720 hr.	20 hr.	1050
Madison Flying Serv., R.F.D. No. 1, Madison, Indiana	J-3	Lyc. 65	477 hr.	No	1050
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Texas	J-3	Cont. 65	596 hr.	Yes	1050
J. A. Atherton, Box 608, Rochester, Minn.	Coupe '39	Cont. 65	800 hr.	600 hr	1050
Towners Fly. Serv., Towanda Arpt., Towanda, Pennsylvania	J-3-40	Lyc. 65	388 hr.	None	1050
Inter-City Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.	J3 '40	Frnkln. 65	456 hr.		1050
Mid-Western Avia. Co., 406 Kirkpatrick Bldg., St. Joseph, Mo.	J-3	Frnkln. 60	192 hr.	None	1045
Palo Alto Arpt., Inc., Box 640, Palo Alto, Cal.		Cont. 65	1203 hr.	250 hr.	1000
Zimmerly Brothers Air Transport, Box 266 Lewiston, Idaho		Cont. 50	1300 hr.	90 hr.	1000
Spann Fly. Serv., Mun. Arpt., Colorado Springs, Colo.	J4	Cont. 65	650 hr.	200 hr.	1000
Richmond Air Trans., Byrd Arpt., Richmond, Va.	J3	Frnkln. 60	530 hr.	215 hr.	1000
Midwest Avia. Corp., Norton Fld., Columbus, O.	Coupe	Frnkln. 60	600 hr.		1000
Stillwater Fly. Serv., Box 466, Stillwater, Okla.	J3C	Cont. A50-5	1073 hr.	N'w eng.	1000
L. L. Rupert, Box 446, Muskogee, Okla.	J3F '40	Frnkln. 50	150 hr.	like new	1000
Midwest Flyers, Lakeside Arpt., E. St Louis, Ill.	J3F	Frnkln. 60	350 hr.	None	995
Mid-Western Avia. Co., 406 Kirkpatrick Bldg., St. Joseph, Mo.	J-3	Frnkln. 50	1230 hr.	Just	985
Midwest Aircraft Co., Harlan, Ia.	'30 Coupe	Cont. 65	500 hr.	1/41	975
Galbraith Air Serv., Munic. Arpt., Paducah, Ky	J3F	Frnkln. 50	398 hr.	No	975
Ben C. Arquitt Mun. Arpt., Lima, Ohio	J3	Frnkln. 60	314 hr.	272 hr.	970
L-H Air Serv., Inc., Hatboro Arpt., Hatboro, Pa.	J-3	Lyc. 55	800 hr.	4/41	950
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Ill.	J3	Frnkln. 50	675 hr.	Never	950
Consolidated Air Serv., Rubinkam Arpt., Harvey, Illinois	J3	Frnkln. 60	570 hr.	None	950
Spann Fly. Serv., Colo. Springs, Colo.	J3	Frnkln. 50	1100 hr.		950
Herman L. Martin, Mun. Arpt., Walla Walla Wash.	J3	Frnkln. 50	1100 hr.	50 hr.	950
Ray Wilson, Inc., Park Hill Arpt., Denver, Colo.	J-3	Frnkln. 50	850 hr.	mjr. 750 hrs.	950
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	J-3	Cont. 50	1100 hr.	50 hr.	950
Inter-City Flying Service, Municipal Arpt., Ft. Wayne, Indiana	J3	Frank. 50	246 hr.		925
G. L. Williams, Syracuse Arpt., Syracuse, N. Y	J3	Frnkln. 60	998 hr.	Recent	925
Zimmerly Brothers Air Transport, Box 266, Lewiston, Ida.		Frank 50	1500 hr.	50 hr.	900
Palo Alto Arpt., Inc., Box 640, Palo Alto, Cal.		Cont. 50	1416 hr.	518 hr.	900
Russ Walling, Walling-Watertown Arpt., Watertown, N.Y.	J3	Frnkln. 50	925 hr.	500 hr.	900
Fayette Airways, Inc., Connellsville Arpt., Connellsville, Pa.	J3	Lyc. 65	343 hr.		900
Fayette Airways, Inc., Connellsville Arpt., Connellsville, Pa.	J3	Frnkln. 65	407 hr.	147 hr.	900
Avia. Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 55	550 hr.	None	900
Consolidated Air Serv., Rubinkam Arpt. Harvey, Illinois	J3	Frnkln. 60	720 hr.	None	900
Al Gillis Fly. Serv., 125 1st Av. N, Great Falls, Mont.	J3C	Cont. 50	900 hr.	50 hr.	900
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-3	Lyc. 55	900 hr.	700 hr.	900
Southern Air Serv., Memphis, Tenn.		Lyc. 50	300 hr.	New	900
Billie Carpenter, Box 15, Winfield, Kansas.	J-3	Frnkln. 50	1450 hr.	1450 hr.	895
Warner Kenyon, 1326-29th St., Ashland, Ky.	J3	Frnkln. 50	510 hr.	No	895
Bennett Air Serv., P.O. Box 247, Hightstown, N.J.	J3	Frnkln. 50	261 hr.	Just	895
Aero Sales Corp., First National Building, Birmingham, Ala.	J-3-F	Frank. 60	600 hr.	Once	875
Virginia Cub Distributors, Box 211, Farmville, Va.	J3	Frnkln. 60	600 hr.	Just	875
White Fly. Serv., Inc., Caldwell Wright Arpt., Caldwell, N. J.	J3	Lyc. 50	1201 hr.	1/41	875
Lexington Fly. Serv., Inc., Lexington Arpt., Lexington, Ky.	J-3	Lyc. 55	1050 hr.	1000 hr.	875
Southern Arwys. Sales Co., Munic. Arpt., Birmingham, Alabama	J-3	Frnkln. 50	450 hr.	425 hr.	875
Billie Carpenter, Box 15, Winfield, Kansas.	J-3	Frnkln 50	850 hr.	730 hr.	850
Rudy Pekrul, Traverse City Arpt., Traverse City, Mich.	J-3-F	Frnkln. 50	1190 hr.		850
West Coast Arcft., L.A. Munic. Arpt., Inglewood, Calif.	J3	Frnkln. 50	590 hr.	460 hr.	850
Frank Rensma, Box 441, Youngsville, Pa.	J3 Sport	Frnkln.	675 hr.	575 hr.	850

FLYING and POPULAR AVIATION USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Krantz Aeron. Serv., Port Erie Arpt., Erie, Pa.	J3	Frnkln. 50	950 hr.	No time sincemaj.	$850
White Fly. Serv., Inc., Caldwell Wright Arpt., Caldwell, N. J.	J3	Lyc. 50	1300 hr.	7/40	850
White Fly. Serv., Inc., Caldwell Wright Arpt., Caldwell, N. J.	J3	Lyc. 50	1275 hr.	8/40	850
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J3L	Lyc. 55	900 hr.	9/40	850
Midwest Avia. Corp., Norton Fld., Col., O.	J3F	Frnkln. 50	1080 hr.	2/41	850
Akron Airw., Inc., Akron Arpt., Akron, Ohio.	J3L	Lyc. 50	765 hr.	600 hr.	850
Akron Airw., Inc., Akron Arpt., Akron, Ohio.	J3L	Lyc. 50	910 hr.	Just	850
Dethloff Fly. Serv., Euclid Ave. Arpt., Willoughby, Ohio	J-3	Frnkln. 50	800 hr.	Just maj.	850
Thomas Metcalf, Toledo Mun. Arpt., Toledo, O.	J-3	Frnkln. 60	810 hr.	620 hr.	825
Red Bank Arpt., Inc., Red Bank, N. J.	J3	Cont. 50	1085 hr.	148 hr.	825
Page Airways, Arpt., Rochester, N. Y.	J3	Lyc. 50	1215 hr.	1086 hr.	800
Avia. Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 50	825 hr.	650 hr.	800
Fayette Airways, Inc., Connellsville Arpt., Connellsville, Pa.	J3	Lyc. 50	776 hr.	250 hr.	800
Matthews & Rappaport, Roosevelt Field, Mineola, N. Y.	J3	Lyc. 55	1500 hr.	Recently	800
Thompson Fly. Serv., Inc., Salt Lake City, Utah	J3	Cont. 50	775 hr.	25 hr.	800
Virginia Cub Distributors, Box 211, Farmville, Va.	J3	Frnkln. 50	800 hr.	600 hr.	800
Johnson Flying Serv., Inc., Missoula, Mont.	J-3	Cont. 50	1400 hr.	200 hr.	795
Fayette Arwys., Inc., Uniontown, Pa.	J-3	Lyc. 50	900 hr.	12/40	785
Mayes Field, Huntington, W. Va.	J-3	Cont. Dual Ign.	680 hr.	600 hr.	775
Smith Fly. Serv., Wilkes-Barre Wyoming Valley Arpt., Forty-Fort, Pa.	J-3	Cont. 50	1230 hr.	870 hr.	775
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J-3	Frnkln. 50	725 hr.	550 hr.	775
Jones Fly. Serv., Sullivant Ave. Airport, Columbus, Ohio	J-3	Frnkln. 50	1500 hr.	No time sincefact	775
Southern Arwys., Munic. Arpt., Birmingham, Ala.	J-3	Lyc. 55	1000 hr.	1000 hr.	750
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-3	Lyc. 50	1100 hr.	Maj.	745
Jenkins Air Serv., Mun. Arpt., Rochester, N. Y.	J3 Trainer	Lyc. 50	1080 hr.	890 hr.	725
Southern Airways, Munic. Arpt., Birmingham, Ala.	J-3	Frnkln. 50	1000 hr.	1000 hr.	700
Avia. Sales, Box. 408, Newport News, Va.	J3L	Lyc. 50	1100 hr.	675 hr.	700
Midwest Avia. Corp., Norton Fld., Col., O.	J3F	Frnkln. 50	1068 hr.	2/41	700
Wallace Aircraft Co., Clarcona, Fla.	J2	Cont. 40	700 hr.	May '41	695
Johnny Haralson, Air. Trans. & Sales Co., Toney Field, Pine Bluff, Ark.	J-3	Cont. A-44	650 hr.	600 hr.	695
Avia. Market, Los Angeles Metro. Arpt., Van Nuys, Calif.	J-2	Cont. 40	810 hr.	Yes	675
Oakland Arcft., Alameda, Calif.	J-2	Cont. 40	1785 hr.	May '40	665
Edwards Flying Serv., Inc., Flushing Airport, Flushing, L. I., New York	J-3	Cont. 40	1126 hr.	Recently	650
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Texas	J-2 '36 Trainer	Cont. 40	647 hr.	Yes	650
Krantz Aeron. Serv., Port Erie, Arpt., Erie, Pa.	J3	Cont. 40	750 hr.	30 hr. since	650
Otha Eddleman, P.O. Box 116, Crane, Texas.	J3C	Cont. 40	3.8 hr.	Once	650
Piedmont Avia., Inc., Mun. Arpt., Winston-Salem, N. C.	J-3	Cont. 40	542 hr.	63 hr.	625
Aircraft Sales of Michigan, Detroit City Airport, Detroit, Michigan	J-3C	Cont. 40	1100 hr.	95 hr.	600
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	J3C	Cont. 40	589 hr.	25 hr.	595
Seidner Fly. Serv., S.A.M. Arpt., Youngstown, Ohio	J-2	Cont. 40	396 hr.	90 hr.	579
Piedmont Avia., Munic. Arpt., Winston-Salem, N. C.	J-3	Cont. 40	516 hr.	201 hr.	575
Thompson Flying Serv., Inc., Salt Lake City, U	J3	Cont. 40	1150 hr.	46 hr.	575
Billie Carpenter, Box 15, Winfield, Kansas.	J-2	Cont. 40	420 hr.	375 hr.	550
Lexington Fly. Serv., Mun. Arpt., Lexington, Ky.	J-2	Cont. A-40-5	825 hr.		550
Blvd. Arpt., Inc., Roosevelt Blvd., Phila., Pa.	J-2	Cont. 40	650 hr.	500 hr.	550
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.	J-2	Cont. 40	250 hr.		550
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	J-2	Cont. 40	574 hr.	100 hr.	525
PITCAIRN					
Boulevard Arpt., Inc., Roosevelt Blvd., Philadelphia, Pa.	J-6-7	Wright 240	340 hr.	No	1800
PORTERFIELD					
Al Guthrie, Stillwater Fly. Serv., Box 466, Stillwater, Okla.	LP-65	Lyc. 65	289 hr.	276 hr.	1500
Otha Eddleman, P.O. Box 116, Crane, Tex.	CP-65	Cont. 65	43 hr.	New	1437
Huron Fly. Serv., Inc., Munic. Arpt., Huron, S. D.		Lyc. 65 Dual	700 hr.		1150
Duane L. Huscher, Box 65, Lawton, Okla.	CP. Delux	Cont. 50	302 hr.	None	1100
Al Guthrie, Box 466, Stillwater, Okla.	CP-50	Cont. 50	960 hr.	14 hr.	950
Colorado Avia. Co., 426 U.S. Nat'l., Denver, Colo.		Cont. 40	None since	Complete major	675
REARWIN					
Aircraft Sales of Michigan, Munic. Arpt., Detroit, Michigan	1835	120 Ken Royce	New	New	5000
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Mich.	Cloudster 3 piece	Ken-Royce 120	New	New	4495

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Aero Sales Corp., First National Building, Birmingham, Ala.	Cloudster	Ken-Royce 120	100 hr.		$4200
C. W. Peterson, Mun. Arpt., Salina, Kansas.	Cloudster	Ken-Royce 120 h.p.	300 hr	Topped 270 hr.	3200
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Mich.	Skyranger 180	Frnkln. 80	19 hr.		2695
Aircraft Sales of Michigan, Munic. Arpt., Detroit, Michigan	Skyranger 175 J	Cont. 75 Injector	New	New	2575
Aero Sales Corp., First National Building, Birmingham, Ala.	Skyranger	Frnkln. 80	New		2545
Aero Sales Corp., First National Building, Birmingham, Ala.	Skyranger	Frnkln. 80	30 hr.		2350
C. Evers, 247 Park Ave., N. Y. C.		Warner 90	138 hr.	None	2250
Paris Fly. Serv., Mun. Arpt., Paris, Texas.	Skyranger 175	Cont. 75	125 hr.		$2100
M. H. Wall, P.O. Box 327, Willoughby, O.	Skyranger 175	Cont. 75	35 hr.		1935
Dewey Eldred Fly. Serv., Inc., Willoughby, O.	Skyranger	Cont. 75	40 hr.		1845
Dawson Air. Serv., Box 852, Salina, Kansas.	9000 L	LeBlond 90	Engine 276 hr.	41 hr.	1200
Jennings Bros., No. Grafton, Mass.		LeBlond 70	680 hr.	50 hr.	1075
E. W. Wiggins Airways, Inc., Boston, Met. Arpt., Norwood, Mass.	8500	LeBlond 85	802 hr.	111 hr.	975
Southern Arwys. of Danville, Box 205, Danville, Va.	1936	LeBlond 85	368 hr.	Never	975
Racine Fly. Serv., Racine Arpt., Racine, Wis.	7000	LeBlond 70	536 hr.	510 hr.	850
RYAN					
Standard Fly. Serv., Inc., Somerset Hills Arpt., Basking Ridge, N. J.	STA	Menasco 125	190 hr.	150 hr.	3450
Schnieder Aero. Serv., Chandler Fld., Fresno, Calif.	Photo-graphic	Wright J-6-9 B-5 10-15-1 Blower	1625 hr.	120 hr.	1350
SIKORSKY					
Aviation Market, L.A. Met. Arpt., Van Nuys, Calif.	S-39	Wasp 450	540 hr.	40 hr.	6850
E. W. Wiggins Arwys., Inc., Providence, R. I.		Wasp 450	600 hr.	Recently	5500
SPARTAN					
Spartan School of Aeronautics, Box 2551, Tulsa, Okla.	C-3-225	Wright J6-7		No time since	700
Spartan School of Aeronautics, Box 2551, Tulsa, Okla.	C-3-165	Wright J6-5	95 since	no time since	500
STANDARD					
Spooner Air Serv., Claremont Arpt., Claremont, N. H.	D-25	Wright J-5 220	786 hr.	225 hr.	1600
Becker Arcft. Sales, Bettis Arpt., Homestead, Pa.	D-25	J-5-225	500 hr.	150 hr.	1500
A. A. Knowles, Rt. 4, Boise, Ida.	New	Wright J 5,220	417 hr.	3/40	1000
Bob Wight, Box 487, Biloxi, Miss.	D-25	J-5-220	Motor 1275 hr.	Motor 670 hr.	850
Blvd. Arpt., Inc., Roosevelt Blvd., Phila., Pa.	D-29-A	Kinner 90	1500 hr.	700 hr.	750
STEARMAN					
Stinson Fly. Corp., San Francisco Mun. Arpt., S. San Francisco, Calif.	Hammond	Menasco 150	500 hr.	10/40	1500
Sioux Skyways, Sioux Falls, S. D.	C3R	Wright J 67 250		75 hr. Since	1250
Tacoma Fly. Serv., Box 157, So. Tacoma, Wash.	C-3-B	Wright J-5 220	1800 hr.	Recently	800
STINSON					
Hyannis Arpt. Corp., Box 592, Hyannis, Mass.	Reliant	Lyc. 245	388 hr.	2/41	6000
Thomas Oakes, 240 Belleville Ave., Bloomfield, N. J.	SR9BD	Lyc. 245	620 hr.	350 hr.	4500
Indiana Air Serv., Inc., Bendix Fld., So. Bend, Indiana	SR-7C	Lyc. 260	1600 hr.	3/41	3500
Neil McCray, Airport, Jamestown, N. Y.	Voyager	Frnkln. 90	165 hr.		3400
Oak Air Serv., Inc., Bates Fld., Mobile, Ala.	Spec. 105	Cont. 80	200 hr.		3250
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	105	Cont. 80 Dual	New	New	3150
Air. Serv., Inc., Bellanca Fld., New Castle, Del.	105	Cont. 80	101 hr.	2 hr.	2950
Oak Air Serv., Inc., Bates Field, Mobile, Ala.	105 Deluxe	Cont. 80	200 hr.		2950
Inter City Aviation, Inc., Boston Munic. Arpt., East Boston, Mass.	105	Cont. 80	92 hr.		2875
Cincinnati Arcft. Serv., Lunken Arpt. Cincinnati, Ohio	105	Cont. 80	201 hr.	Never	2850
Aviation Market, L.A. Met. Arpt., Van Nuys, Calif.	105	Cont. 80	145 hr.	New	2750
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	105 '40	Cont. 80	246 hr.	34 hr.	2635
Foren-Carroll Corp., Thomas B. Joy Arpt., Fraser, Mich.	105	Cont. 80	78 hr.		2600
Paul E. DePover, Marshall, Minn.	105	Cont. 180	80 hr.		2600
Portland Fly. Serv., Inc., Mun. Arpt., Portland, Maine	105	Cont. 80	260 hr.		2595

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Jenkins Air Serv., Inc., Mun. Arpt., Rochester, N. Y.	105	Cont. 80	215 hr.		$2550
Edwards Flying Serv., Inc., Flushing Arpt., Flushing, L. I., New York	105	Cont. 80	625 hr.	Just	2500
Pete Grim, RFD 4, Staunton, Va	105	Cont. 80	211 hr.	None	2500
Moline Fly. Serv., Mun. Arpt., Moline, Illinois	SR-5A	Lyc. 245	850 hr.	760 hr.	2495
Narragansett Avia. Serv., R.I. State Arpt., Hillsgrove, R. I.	105 '40	Cont. 80 Starter	454 hr.	Just Majored	2495
John Ruzicks, Circus City Arpt., Peru, Ind.	Reliant	Lyc. 215	460 hr.	60 hr.	2400
Fayette Airways, Inc., Connellsville Arpt., Connellville, Pa.	105	Cont. 75	146 hr.		2200
Doug Schall, Inc., 33 Clagett Rd., Hyattsville, Md.	105	Cont. 180	200 hr.	Eng.50hr.	2450
Leech Aircraft, Inc., Hangar F, Roosevelt Field, Mineola, New York	1939	Cont. 80	600 hr.	246 hr.	2350
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Michigan	105	Cont. 75	900 hr.	200 hr.	2150
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo	105	Cont. 175	400 hr.	Yes	2150
Leech Aircraft, Inc., Hangar F, Roosevelt Field, Mineola, N. Y.	105	Cont. 75	445 hr.	50 hr.	2100
Upton & Bowen, West Memphis, Ark.	105	Cont. 75	275 hr.	5 hr.	2000
Narragansett Avia. Serv., R.I. State Arpt., Hillsgrove, R. I.	SR 5	Lyc. 225	1350 hr.	10 hr.	1900
Colorado Aviation Company, 426 U. S. Nat'l Bank Building, Denver, Colo	105	Cont. 75	380 hr.	Recently	1900
Matthews & Rappaport, Roosevelt Field, Mineola, N. Y.	Reliant	Lyc. 215	1800 hr.	Recently	1800
Foren Carroll Corp., Fraser, Michigan	105	Cont. 75	1040 hr.	1015 hr.	1640
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Michigan	R	Lyc. 215	1000 hr.	190 hr.	1350
Becker Aircraft Sales, Bettis Arpt., Homestead, Pa.	SR	Lyc. 225	600 hr.	50 hr.	1350
Akron Airways, Arpt., Akron, Ohio	SR	Lyc.	850 hr.	350 hr.	1350
Doug Schall, Inc., 33 Clagett Rd., Hyattsville, Md.	Stinson '33	Lyc. 215	900 hr.		1300
Aircraft Sales of Michigan, Munic. Arpt., Detroit, Michigan	R	Lyc. 215	1200 hr.	190 hr.	1195
Springfield Avia. Co., Munic. Arpt., Springfield, Illinois	SM8A	Lyc. 215	750 hr.	360 hr.	1050
Livingston Airways Corp., Chapman Fld., Waterloo, Iowa	SM-8A	Lyc. 215	930 hr.	900 hr.	1000
DuBois Avia. Assoc., Munic. Arpt., DuBois, Pa.	S	Lyc. 215	1053 hr.	347 hr.	950
Louis A. Musgrove, Munic. Arpt., Elkins, W. Va.	S	Lyc. 215	1000 hr.	400 hr.	900
Decatur Avia. Co., Decatur Arpt., Decatur, Ill.	Smif	Wright 330	850 hr.	240 hr.	895
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	SM1F	Wright J69 330 h.p.	850 hr.	220 hr.	895
Maheux's Airport, Inc., Stevens Mill Road, Auburn, Maine	SM8A	Lyc. 215	970 hr.	226hr.	875
Flying Dutchman Air. Serv., Sometown Arpt., Phila., Pa.	SM-8A	Lyc. 220	1474 hr.	30 hr.	875
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	S-M8A	Lyc. 215	850 hr.	820 hr.	800
California Arcft. Corp., Box 170, Van Nuys, Calif.	SM1	Wright J-5 220	1900 hr.	100 hr.	750
Becker Arcft. Sales, Bettis Arpt., Homestead, Pa.	SM8A	Lyc. 215	700 hr.		700
Leeward Avia., New Kensington, Pa.	SM-2	Warner 125	550 hr.	Yes	500
TAYLORCRAFT					
Fred C. Romy, Munic. Arpt., Ft. Wayne, Ind.	DeLuxe	Cont. 65	52 hr.		2050
Inter-City Flying Service, Munic. Arpt., Ft. Wayne, Indiana	Deluxe	Cont. 65	176 hr.	New 5/22/41	1925
Avia. Mkt., L.A. Metro. Arpt., Van Nuys, Calif.	BL-65	Lyc. 65	38 hr.	New	1875
Tuscarawas County Aviation, Inc., Munic. Airport, New Philadelphia, Ohio	BL12	Lyc. 65	81 hr.	Never	1825
Hubert & Dillon Air Serv., Box 177-S, Tacoma, Wash.	BL Del.	Lyc. 65 dual	200 hr.		1825
West Coast Arcft., L. A. Munic. Arpt., Inglewood, Calif.	Silvercraft	Lyc. 65	53 hr.	New	1795
Duane L. Huscher, Box 65, Lawton, Okla.	B.C.	Cont. 65	180 hr.		1765
Aviation Market, L.A. Metro. Arpt., Van Nuys, Calif.	BL65	Lyc. 65	35 hr.	New	1750
Walter D. Mauk, Box 556, Blackwell, Okla.	'40 DeLuxe	Cont. 65	21 hr.	New	1750
Wichita Falls Air Transp. Co., Box 84, Munic. Arpt., Wichita Falls, Tex.	BL-65	Lyc. 65	New	New	1750
Springfield Avia. Co., Munic. Arpt., Springfield, Ill.	BC-65	Cont. 65	195 hr.	None	1750
Dufort Sch. of Aeronautics, 57 Ft. Covington St., Malone, N. Y.		Cont. 65	390 hr.	New May '40	1725
Dufort School of Aeronautics, Massena Airport, Massena, N. Y.	BC	Cont. 65	390 hr.		1695
Washington Pk. Arpt., Homewood, Ill.		Cont. 65	150 hr.	None	1650
Palmyra Arpt., 817 Lincoln Ave., Palmyra, N. J.	BL	Lyc. 65 h.p.	138 hr.	Never	1625
Aircraft Sales of Michigan, Detroit City Arpt., Detroit, Michigan	BC Deluxe	Cont. 65	190 hr.		1600
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	Deluxe BC	Cont. 65	950 hr.	Maj.now	1600
West Coast Arcft., L. A. Munic. Arpt., Inglewood, Calif.	BC-65	Cont. 65	465 hr.	No	1595
F. F. Swinson, 101-107 S. Main St., Pratt, Kansas	'40 Deluxe	Lyc. 65	300 hr.		$1550
Hubert & Dillon Air Serv., Box 177S, Tacoma, Wash.	BC	Cont. 65	450 hr.	Motor topped	1525
Roch. Aeron. Corp., Roch. Arpt., Roch., N. Y.	BL-65	Lyc. 65	80 hr.		1525
Clinch Flying Service, Municipal Airport, North Platte, Nebraska	BL	Lyc. 65	1540 hr.		1500
Narragansett Avia. Serv., R.I. State Arpt., Hillsgrove, R. I.	BL 40	Dual Ign. Lyc. 65	254 hr.	Will be	1495
Niederheauser Airways, 111½ West Church St., Marshalltown, Iowa	BL	Lyc. 65	400 hr.	400 hr.	1475
St. Louis Flying Service, Lambert Field, Robertson, Mo.	BL-65	Lyc. 65	180 hr.	Recently	1475
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	BL-65	Lyc. 65	58 hr.	New	1475
Fred C. Romy, Munic. Arpt., Ft. Wayne, Ind.	DeLuxe	Cont. 65	830 hr.	1/5/41	1465
Louis A. Musgrove, Munic. Arpt., Elkins, W. Va.	BL-T	Lyc. 65	350 hr.	350 hr.	1450
Ranger Fly. Serv., Ranger, Texas	BL-65	Lyc. 65	140 hr.	140 hr.	1450
Rochester Aeronautical Corp., Rochester Arpt., Rochester, N. Y.	BL-65	Lyc. 65	470 hr.		1450
Inter-City Fly. Serv., Munic. Arpt., Ft. Wayne, Ind.	BC DeLuxe	Cont. 65	800 hr.	757 hr.	1445
Niederhauser Airways, 111½ West Church St., Marshalltown, Iowa	BL	Lyc. 65	700 hr.	600 hr.	1400
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	DeLuxe BL	Lyc. 65	675 hr.	None	1400
Palmyra Arpt., 817 Lincoln Ave., Palmyra, N. J.	BL	Lyc. 65	318 hr.	Never	1400
Ranger Fly. Serv., Munic. Arpt., Ranger, Texas	BL-65	Lyc. 65 dual	170 hr.	170 hr.	1395
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 50	85 hr.	None	1390
Tuscarawas County Aviation, Inc., Municipal Airport, New Philadelphia, Ohio	BL	Lyc. 65	504 hr.	Never	1375
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N. Y.	'40 Deluxe	Lyc. 65	160 hr.	Never	1375
Inter-City Flying Service, Municipal Airport, Ft. Wayne, Ind.	'40 Craft Deluxe	BC65 Cont. 65	900 hr.	796 hr.	1350
Dawson Air Serv., Box 852, Salina, Kans.	DeLuxe BL	Lyc. 65	840 hr.	Just	1350
Dufort Sch. Aerona, 57 Ft. Covington St., Malone, N. Y.	BT	Lyc. 55	225 hr.	New Oct. '40	1350
Ranger Fly. Serv., Ranger, Texas	BL-55	Lyc. 55	180 hr.	180 hr. 639 hr.	1350
Tuscarawas County Aviation, Inc., Municipal Airport, New Philadelphia, Ohio	BL	Lyc. 65	652 hr.	5/41	1325
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N. Y.		Lyc. 65	160 hr.		1325
Inter-City Fly., Munic. Arpt., Ft. Wayne, Ind.	BL '40	Lyc. 50	326 hr.		1325
Greenville Sch. Avia., Treaty City Arpt., Greenville, Ohio	BL	Lyc. 65	265 hr.	None	1300
Hopwell Fly. Serv., Hopewell Arpt., Hopewell, Va.	BL-65	Lyc. 65	375 hr.	9/40	1300
Greenville Sch. Avia., Treaty City Arpt., Greenville, Ohio	BL	Lyc. 55	185 hr.	None	1250
Dethloff Flying Service, Euclid Avenue Airport, Willoughby, Ohio		Lyc. 55	200 hr.	No	1200
Earl J. Howard, P.O. Box 565, Ames, Iowa	BLT	Lyc. 65	510 hr.	None	1200
Marlboro Arpt., Inc., Farm Road, Marlboro, Mass.	BL-65	Lyc. 65	372 hr.	None	1200
Rochester Aeron. Corp., Rochester Arpt., Rochester, N. Y.	BL-55	Lyc. 55	500 hr.	None	1200
Boyd Mote, Denman Ave., Coshocton, Ohio	BL-50	Lyc. 50	105 hr	New 1940	1195
Inter-City Aviation, Inc., Boston Airport, East Boston, Mass.	'39	Lyc. 55	550 hr.	Just	1175
Dufort School of Aeronautics, Massena Airport, Massena, New York	BL	Lyc. 55	395 hr.		1150
Four Lakes Aviation Corp., Royal Airport, Madison, Wisc.	B'39 DeLuxe	Lyc. 65	525 hr.	360 hr.	1150
Fowler Flying Service, Airport, Dodge City, Kansas	BLT	Lyc. 55	750 hr.	550 hr.	1150
Dufort Sch. Aero., 57 Ft. Covington St., Malone, N. Y.	BT	Lyc. 55 h.p.	395 hr.	New 5/40	1175
Dawson Air Serv., Box 852, Salina, Kans.	DeLuxe BL	Lyc. 55	720 hr.	60 hr.	1150
Howard Flying Service, Box 565, Ames, Iowa.	BLT	Lyc. 65	800 hr.	300 hr.	1100
Howard Flying Service, Box 565, Ames, Iowa.	BLT	Lyc. 65	1200 hs.	Just	1100
Zimmerly Brothers Air Transport, Box 266, Lewiston, Ida.	BL	Lyc. 50	955 hr.	10 hr.	1100
Palmyra Arpt., 817 Lincoln Ave., Palmyra, N. J.	BLT	Lyc. 50 h.p.	373 hr.	83 hr. Since Maj.	1100
Dewey Eldred Fly. Serv., Lost Nation Arpt., Willoughby, Ohio	BL-65	Lyc. 65	Ship 831 hr.	11/40	1100
Phillips Flying Service, Arpt., Mt. Pleasant, Mich.	BL-50	Lyc. 50	800 hr.	650 hr.	1100
Hood Air-Craft Sales Co., Box No. 171, Northampton, Mass.	Deluxe	Lyc. 50	800 hr.	180 hr.	1050
Duane L. Huscher, Box 65, Lawton, Okla.	BF	Frnkln. 50	1302 hr.	197 hr.	1050
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	BL	Lyc. 50	570 hr.	No	1050
Ryan Air Serv., Decorah, Iowa	Late '39	Lyc. 50	770 hr.	350 hr. Since	1050
Wichita Falls Air Transp. Co., Box 84, Munic. Arpt., Witchita Falls, Texas	BLT-55	Lyc. 55	400 hr.	50 hr.	1050
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.	BL-50	Lyc. 50	1100 hr.	900 hr.	1050
Merrill Hale, Hillsgrove, R. I.		Frnkln. 50	268 hr.	35 hr.	1050
Hood Aircraft Sales Co., Box No. 171, Northampton, Mass.	Deluxe	Lyc. 55		Recently	1000

FLYING and POPULAR AVIATION USED PLANE LISTING OF AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE	TIME	OVER-HAULED	PRICE
Albert E. Phillips, 106 South Main, Tulsa, Okla.	BL Frnkln. 50 Dual	424 hr.		$ 100
Indiana Air Serv., Bendix Fld., South Bend, Ind.	BL Lyc. 55	1038 hr.		1000
Louis A. Musgrove, Box 814, Morgantown, W. Va.	BL Lyc. 50	725 hr.	150 hr.	1000
Spartan School of Aeron., Box 2551, Tulsa, Okla.	BL-50 Lyc. 50	1400 hr.	160 hr.	1000
Rochester Aeron. Corp. Rochester Arpt., Rochester, N. Y.	BL-65 Lyc. 65	1102 hr.	140 hr.	1000
Dewey Eldred Fly. Serv., Inc., Willoughby, O.	Lyc. 55	1036 hr.	Just	995
Narragansett Avia. Serv., R. I. State Arpt., Hillsgrove, R. I.	BF Frnkln. 50	351 hr.	130 hr. Since	995
Dewey Eldred Fly. Serv., Lost Nation Arpt., Willoughby, Ohio	BLT-50 Lyc. 50	875 hr.	Recently	975
Fowler Fly. Serv., Arpt., Dodge City, Kans.	BL Lyc. 55	1100 hr.	25 hr.	950
Louis A. Musgrove, Munic. Arpt., Elkins, W. Va.	BL-T Lyc. 55	1100 hr.	25 hr.	950
Schneider Aero. Serv., Chandler Fld., Fresno, Calif.	BC Cont. 50	1216 hr.	106 hr.	950
A. B. Eugle, 518 Lake Avenue, Lake Worth, Fla.	50L Cont. 40	380 hr.	Rebuilt May '41	900
Hobley-Maynard Air Serv., New Orleans Airport, New Orleans, La.	BL Lyc. 50	1600 hr.	No time since	900
Indiana Air Serv., Bendix Fld., South Bend, Ind.	BL Lyc. 50	970 hr.		900
Hobley-Maynard Air Serv., Inc., New Orleans Arpt., New Orleans, La.	BL-50 Lyc. 50	1500 hr.	Recently	900
Foster A. Lane, Lane Avia. Corp., Cleveland Arpt., Cleveland, Ohio	Lyc. 50	950 hr.	50 hr.	875
Moberly Fly. Serv., 605 Concannon St., Moberly, Mo.	'39 Frnkln. 50	720 hr.	Topped 60 hr. ago	875
Schneider Aero Service, Chandler Field, Fresno, Calif.	B-C Cont. 50	1377 hr.	106 hr.	850
Piedmont Avia., Munic. Arpt., Winston-Salem, N. C.	'39 Frnkln. 50	563 hr.	164 hr.	825
Jennings Bros., No. Grafton, Mass.	Cont. 40	660 hr.	100 hr.	800
Canton Avia. Co., Martin Fld., Canton, O.	BLT Lyc. 50	780 hr.	Engine Maj.	795
Atlantic Aviation Service, Dupont Airport, Wilmington, Del.	Frnkln. 50	1000 hr.	Low	775
Kenneth Benesh, Monticello, Ia.	A Cont. 40	180 hr.	None	745
Duane L. Hutcher, Box 65, Lawton, Okla.	A Cont. A40-4	600 hr.	75 hr.	725
Rome Boekenhoff, Jr., 2038 Spring St., Quincy, Ill.	A Cont. 40	576 hr.	2/41	700
Carnahan Fly. Serv., Bloomington, Ill.	Cont. 40	507 hr.	Since 100 hr.	700
Des Moines Fying Service, Inc., Munic. Airport, Des Moines, Ia.	A Cont. 40	755 hr.	65 hr.	695
Merrill Hale, Hillsgrove, R. I.	Cont. 40	1081 hr.	100 hr.	695
Virginia Cub Distributors, Box 211, Farmville, Va.	Cont. 40	500 hr.	Just	670
Roy D. Hume, Box 551, Arkansas City, Kans.	A Cont. A-40	1015 hr.	No time	655
Lynchburg Air Transport and Sales Corp., Preston Glenn Airport, Lynchburg, Va.	'38 Cont. 40	395 hr.		650
Springfield Avia. Co., Munic. Arpt., Sprgfld,Ill.	Cont.A-40-4	375 hr.	None	650
J. L. Wells, 106 W. Main, Avon Park, Fla.	Cont. 40	690 hr.	100 hr.	650
Southern Airways, Municipal Airport, Birmingham, Ala.	Cont. 40	400 hr.	400 hr.	600
Inter-City Fly. Serv., Ft. Wayne, Ind.	'38 Cont. 40	600 hr.		600
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	A Cont. 40	550 hr.	520 hr.	600
Southern Airways, Munic. Arpt., Birmingham, Ala.	A Cont. 40	375 hr.	350 hr.	550
TRAVELAIR				
Speer Flying Service, 3330 Barnett, San Diego, Calif.	16E Wright 125	1235 hr.	75 hr.	2950
Falcon Arcft. Corp., L.A. Munic. Arpt., Inglewood, Calif.	Osprey Wright 250	814 hr.	Major 80 hr.	2500
Art Whitaker, Box 3820, Portland, Oregon.	Wright J6-7	1100 hr.	100 hr.	1850
Lynchburg Air Transport and Sales Corp., Preston Glenn Airport, Lynchburg, Va.	4000 J5 Wright 220	1100 hr.	100 hr.	1600
Dufort School of Aeronautics, Massena Airport, Massena, New York.	BL Lyc. 65	225 hr.		1295
Northeast Airways, Inc., Portland City Arpt., Portland, Maine.	Trainer '40 Lyc. 55	591 hr.	91 hr.	1250
Indiana Air Serv., Inc., Bendix Fld., So. Bend, Ind.	4000 Wright J-5, 220	940 hr.	7/40	1200
Aviation Service Company, Inc., Box 32, Hartford, Conn.	BL Lyc. 55	324 hr.	No	1200
Clinch Flying Service, Municipal Airport, North Platte, Nebr.	BL Lyc. 50	931 hr.	908 hr.	1200
Louis A. Musgrove, Airport, Elkins W. Va.	BL-T Lyc. 65	600 hr.	200 hr.	1200
H. E. Oliver, 63 Orchard St., Pittsfield, Mass.	BL Lyc. 55	450 hr.	Top 400 hr.	1200
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	4000 Wright J-5, 220	1590 hr.	110 hr.	1175
Sky Harbor, Inc., BR 11, Box 551, Indianapolis, Indiana	E4000 Wright J65 175 h.p.	900 hr.		1100
Kenneth Benesh, Monticello, Ia.	4000 Wright J-5, 225	1200 hr.	30 hr.	$1100
Cedar Rapids Arwys., Inc., Cedar Rapids, Ia.	4000 Wright J65	12 hr.	Since	1050
C. W. Peterson, Munic. Arpt., Salina, Kans.	C-4000 Chall. 185	600 hr.	Topped 12 hr.	1000
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	4000 Wright J-5	975 hr.	15 hr.	1000
Albert E. Padags, Tri-City Airport, Wisc. Rapids, Wisc.	4000 J4 200	630 hr.	615 hr Major	1000
Foster A. Lane, Port Columbus, Columbus, O.	4000 Kinner KS 100	545 hr.	210 hr.	750
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Aviation Service Co., Inc., Box 32, Hartford, Conn.	YOC Jacobs L4 225	720 hr.	510 hr.	2300
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Inter-City Avia., Inc., Boston Munic. Arpt., E. Boston, Mass.	Cabin Jacobs 225	845 hr.	213 hr.	2175
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	UKC Cont. 210	750 hr.	750 hr.	2150
Aircraft Sales of Michigan, Detroit City Airport, Detroit, Michigan	UKC Cont. 210	850 hr.	5 hr.	2150
John P. Hall, W. Haven Arpt., West Haven, Conn.	YMF Jacobs 225	710 hr.	60 hr.	2100
J. L. Wells, 106 W. Main, Avon Park, Fla.	YKC Jacobs 225	650 hr.	200 hr.	2000
Page Airways, Inc., Munic. Airport, Rochester, New York	C Cont. 210	1310 hr.	24 hr.	2000
Bay State Flying Service, Framingham Airport, Framingham, Mass.	Cabin UIC Cont. 210	700 hr.	60 since major	1950
Southern Arwys. of Danville, Box 205, Danville, Va.	YKC Jacobs 225	917 hr.	550 hr.	1850
Spartan School of Aeronautics, Box 2551, Tulsa, Okla.	EGC-7 760E Wright 320	1530 hr.	600 since	1800
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Forced Landings

(*Continued from page 98*)

before going into a small field, go to a safe altitude and practice glides and stalls. Learn the stall by feel, sight and sound together.

"2. Training in simulated forced landings should be made from fields with suitable landing areas. . . ." This means a *good* field, not a clearing. Don't practice forced landings where the obstructions on the other side consist of a high tension power line, tall pine trees and a downdraft.

"3. The engine must be properly maintained and adjusted to operate while idling in a glide." If it isn't, don't practice such landings! If the weather is humid and cold, watch out for icing. Listen to the engine, be concious of it and clear it out now and then. And above all, don't get yourself in such a place that an engine failure means a large hospital bill. If the procedure outlined herein is carried out, the plane will never be in such a position—but watch the engine nevertheless.

"4. Simulated forced landings during take-offs should not be practiced except when there is a landing area available . . . not to exceed 45° from the point the throttle is closed." In short, practice forced landings on take-offs from a large field and if it turns out to be the real thing you won't find a splintered fence-post in your lap instead of the control stick.

"5. The instructor should be in full command of the situation at all times and ready to take over the controls, should the need arise." Obviously, it doesn't prove a thing to let the student spin you in and to tell him after the smoke clears away: "I told you so. Now let that be a lesson to you." Tell the student beforehand about the correct procedure and then make him stick to it!

END

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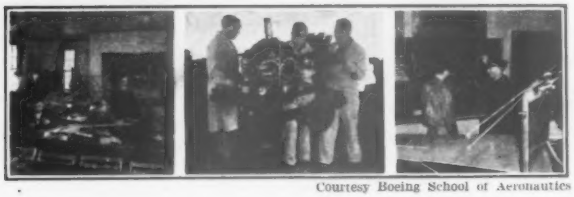

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